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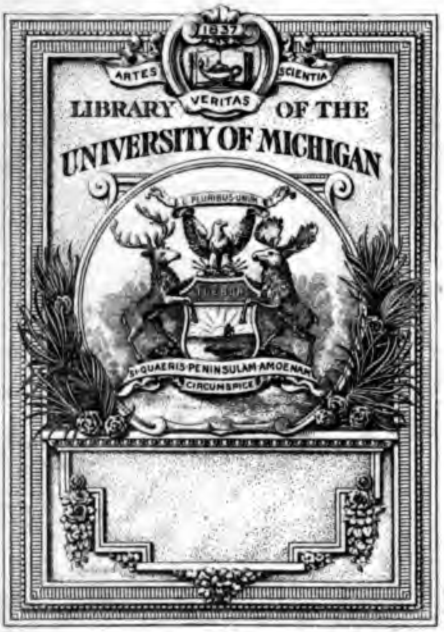

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U.S. Signal Service Report for
1882, Part 2.

REPORT

OF THE

SECRETARY OF WAR;

BEING PART OF

THE MESSAGE AND DOCUMENTS

COMMUNICATED TO THE

TWO HOUSES OF CONGRESS

AT THE

BEGINNING OF THE SECOND SESSION OF THE FORTY-SEVENTH CONGRESS.

IN FOUR VOLUMES.

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PART 2.

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APPENDIX 76.

MONTHLY WEATHER REVIEW, JULY, 1881.

INTRODUCTION.

In preparing this review the following data, received up to August 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 151 monthly journals and 174 monthly means from the former, and 15 monthly means from the latter; 213 monthly registers from voluntary observers; 54 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of July, 1881, is shown by isobaric lines (in black) upon Chart No. II. The area of lowest pressure covers the Canadian Maritime Provinces, and the areas of high the Gulf States, Tennessee, the Upper Mississippi and Lower Missouri Valleys, and the Northern Pacific coast region. Within the same parallels the pressure is quite evenly distributed over the country east of the 100th meridian. Compared with the preceding month, the pressure is generally higher over the entire country, the increase ranging from 0.01 to 0.13 inch. The regions of greatest change are found in the States bordering the Mississippi River and along the Northern Pacific coast.

Departures from the normal values for the month.—Compared with the means for previous years, the mean pressure of the present month is below the average at all stations east of the boundary formed by the junction of the Mississippi and Ohio Rivers, the western line of Pennsylvania and the eastern shores of Lakes Erie and Ontario, and the Saint Lawrence River. Westward of this boundary to, and including the Pacific coast regions, the pressure is generally above the mean. Within no district over the country do the departures indicate an unusual variation from the mean, the general range being from normal to 0.10 inch, the latter reported from only two stations, New London and Wilmington, and normal from Galveston, Brownsville, Tex.; Punta Rassa, Denison, Tex.; Louisville and Denver. The regions of greatest departure are the Atlantic coast States from Jacksonville to Eastport, the Upper Lake region, Minnesota and California, showing a variation of from 0.04 to 0.10 inch. The regions of least departure are the Gulf coast, Tennessee and the Ohio Valley, ranging from normal to 0.02 inch.

Barometric ranges.—The range of pressure for the month has in general varied from 0.4 to 0.6 inch, and in the extremes from 0.16 inch at Fort Davis, Texas, to 0.97 inch at Eastport. Throughout the several districts the monthly barometric range varied as follows: New England, 0.74 inch at New Haven to 0.97 inch at Eastport; Middle Atlantic States, 0.52 at Delaware Breakwater to 0.76 at Albany; South Atlantic States, 0.39 at Jacksonville to 0.59 at Macon and Kittykawk; Eastern Gulf States, 0.26 at Key West to 0.36 at Pensacola; Western Gulf States, 0.25 at Indianola and Galveston to 0.43 at Fort Gibson; Rio Grande Valley, 0.25 at Eagle Pass to 0.30 at Brackettville; Ohio Valley and Tennessee, 0.35 at Memphis to 0.67 at Columbus; Lower Lake region, 0.50 at Cleveland to 0.67 at Oswego; Upper Lake region, 0.54 at Port Huron to 0.68 at Marquette; Upper Mississippi Valley, 0.42 at Cairo to 0.66 at Des Moines; Missouri Valley, 0.58 at Leavenworth to 0.72 at Fort Bennett; extreme Northwest, 0.62 at Fort Buford to 0.78 at Saint Vincent; Northern Slope, 0.44 at Cheyenne to 0.61 at Fort Keogh; Middle Slope, 0.35 at Fort Elliott to 0.56 at Dodge City; Southern Slope, 0.16 at Fort Davis to 0.41 at Fort Griffin; Northern Plateau, 0.54 at Eagle Rock to 0.73 at Lewiston; Middle Plateau, 0.41 at Pioche to 0.54 at Salt Lake City; Southern Plateau, 0.19 at Silver City to 0.43 at Phœnix; North Pacific coast, 0.49 at Roseburg to 0.52 at Portland; Middle Pacific coast, 0.37 at San Francisco to 0.52 at Red Bluff; South Pacific coast, 0.24 at San Diego to 0.42 at Yuma.

Areas of high barometer.—Four such areas have been sufficiently important during the month of July, 1881, to merit description.

No. I.—This area, which was partly described in the June Review as high area No. VI, was present in the Upper Lake region on the morning of the 1st as an area of 30.2. Northerly winds prevailed in the Lake region, New England, and the Middle Atlantic States, with clear weather, and southerly winds and threatening weather in the South Atlantic States. By the afternoon reports, the winds in the South Atlantic States had shifted to northeasterly, and heavy rains were reported from that district and the East Gulf States, and local rains from the Ohio Valley and Tennessee. The temperature fell during the 1st from 4° to 12° at stations in the South Atlantic and Gulf States, and rose slightly in the Lower Lake region. The area moved slowly southeastward during the 1st and 2d, and on the morning of the 3d was central in Tennessee. During the 2d the winds in the Lake region, New England, and the Middle Atlantic States backed to southwesterly, and the temperature rose decidedly in all but the latter district, in which it remained nearly stationary. The weather cleared in the South Atlantic and Gulf States, and on the morning of the 3d fair weather prevailed in all districts east of the Mississippi River and in the Northwest. During the 3d the area remained nearly stationary, the pressure increasing slightly in the Gulf States and decreasing slowly, with rising temperature, in the Northwest, and thence eastward to the Atlantic coast. During the 4th the high barometer moved slowly southward, and during the 5th and 6th was central as an area of 30.1 in the Gulf States; after the latter date it ceased to have any marked influence on the weather conditions. The minimum temperatures for the month were caused by this area at many of the stations in the Lake region, the Ohio Valley and Tennessee on the 1st and 2d; in the Middle Atlantic States on the 2d and 3d, and in the South Atlantic States on the 3d and 4th. Cautionary signals were displayed on the Atlantic coast from Cape Henry, Va., to Macon, N. C., on the morning of the 1st in anticipation of northeasterly winds. They were lowered at midnight of the 2d, having been partly justified by the following maximum velocities: Cape Henry, NE. 25 miles; Kittyhawk, NE. 34; Cape Hatteras, NE. 28, and Macon, N. 28.

No. II.—On the morning of the 8th low area No. II was central in Manitoba, and the pressures in the Northwest were below the mean—Omaha barometer 0.25 inch below the normal. During the 8th and 9th the pressures rose rapidly in the extreme Northwest and in the Lower Missouri and Upper Mississippi Valleys in rear of the depression which moved eastward north of the latter district. The high area moved slowly eastward across the Lakes during the 9th and 10th, causing local rains in the Lake region on the 10th and 11th, and in New England on the latter date. The minimum temperatures for the month at stations in the Upper Missouri Valley occurred on the 8th and 9th.

No. III.—During the night of the 20th and morning of the 21st the barometer rose rapidly in all districts west of the Mississippi River, and on the afternoon of the latter date an area of high barometer made its appearance in Montana, Fort Shaw barometer 0.27 inch, and Fort Buford barometer 0.26 inch above the mean. Low area No. V was then central in the Upper Mississippi Valley near La Crosse. The pressures west of the Mississippi continued to increase slowly until the 24th, the high barometer remaining nearly stationary. On the 25th and 26th the barometer fell slowly on the Pacific coast but rose slightly in the Northwest, and at the afternoon report of the latter date the high area was central in the Upper Mississippi Valley, in which district and in the Lake region the pressures gradually increased until the 29th, when the barometer was above the normal in all districts east of the Mississippi River, excepting the South Atlantic and East Gulf States, and the high area became merged in area No. IV, which was then southeast of New England. The minimum temperatures for the month occurred in connection with this area in the Lower Missouri and Upper Mississippi Valleys on the 26th and 27th.

No. IV.—At midnight of the 27th the pressures were below the mean in New England and the Lower Lake region, and the Middle and South Atlantic and Gulf States. The pressures increased slowly in the Middle and South Atlantic States and rapidly in New England and the maritime provinces during the 28th, and in the two latter districts were slightly above mean at midnight. Easterly winds prevailed in New England and the maritime provinces. This pressure continued to increase rapidly in these districts during the 29th, with easterly winds in the former and southwesterly winds in the latter district. Local rains were reported from both districts, followed by clearing weather in the maritime provinces during the afternoon, and in New England during the night. The barometer on the morning of the 30th was from 0.3 to 0.4 inch above the mean in New England and the maritime provinces, and local rains were reported from the North Carolina coast. The area of high barometer remained nearly stationary southeast of New England during the 30th and 31st, the pressures slowly increasing in the Middle and South Atlantic States, and falling slowly in the Saint Lawrence Valley and in the Gulf; at midnight of the latter date the barometer was still 0.23 inch above the mean in New England. Rain continued in the Middle and South Atlantic States during the 30th and 31st, clearing in the former district on the 31st. Cautionary signals were ordered on the morning of the 30th from Sandy Hook, N. J., to Macon, N. C. They were lowered from Cape May to Cape Henry at the afternoon report of the 30th; at Atlantic City, Barnegat, and Sandy Hook at midnight, and on the morning of the 31st at Kittyhawk, Hatteras, and Macon. They were justified by the following maximum velocities: Hatteras, SE. 32 miles; Kittyhawk, E. 36; Chincoteague, E. 25; Delaware Breakwater, NE. 31; Atlantic City, NE. 25, and Sandy Hook, E. 32.

Areas of low barometer.—Five such areas have been charted for the month of July, 1881. None of them exhibited special energy.

No. I.—During the 3d the pressure decreased slowly in the extreme Northwest, and at midnight a depression was central in the Saskatchewan Valley; Fort Stevenson, barometer 0.32 inch below the normal. High area No. I was then central in Tennessee. The temperature had risen in the Northwest, the Lake region, the Ohio Valley, and New England. Light rains were reported from the Northern Rocky Mountain slope. The depression moved slowly eastward north of the Lakes, and at midnight of the 5th was central north of Montreal; thence pursuing a southeasterly course across New England, it was east of Boston in the morning of the 6th, and had disappeared by the afternoon of the same date. This depression was unaccompanied by precipitation in the Northwest and the Lake region, but caused light rains in New England and the maritime provinces on the 5th. Cautionary signals were displayed in advance of this depression at stations on Lakes Michigan and Superior. They were not justified. The maximum temperatures for the month at a majority of the stations in the Middle Atlantic States and southern portion of New England occurred in connection with this area on the 6th.

No. II.—During the 6th the barometer fell decidedly over the Northern Slope and Plateau regions, and in the afternoon an area of low barometer was apparently central in the Saskatchewan Valley, although the barometer remained slightly above the mean in all districts in the United States except on the immediate Atlantic coast. Owing to missing reports the track of the depression cannot be accurately charted during the next two days, but the barometer continued to fall in the Northwest, and the depression moved slowly eastward, and at midnight of the 7th was northwest of Fort Garry; Bismarck, barometer 0.45 inch below the normal. On the afternoon of the 8th it was north of Lake Superior; Duluth, barometer 0.28 inch below the normal. During the 8th, 9th, and 10th it continued its eastward movement north of the Lakes and through the Saint Lawrence Valley, and disappeared by the afternoon of the 11th.

No. III appeared over the Northern Slope on the 11th, and at the afternoon report was central near Deadwood; barometer 0.24 inch below the normal. Local rains were reported from stations in the extreme Northwest. Moving slowly eastward the depression was north of Lake Superior on the morning of the 12th; Marquette, barometer 0.26 inch below the normal. Heavy rains were reported from the Upper Lake region. It continued to move eastward north of the Lakes, causing general rains in the Lake region and occasional thunder-storms in the Mississippi Valley; at midnight it was north of Rockliffe; Kingston, barometer 0.16 inch below the normal. Numerous rains were reported from the Middle Atlantic States on the 13th, and at midnight the depression was west of Chatham; thence it moved eastward off the Atlantic coast. Pressures in the maritime provinces remained below the normal until the 18th, when they gradually recovered. No cautionary signals were ordered for this depression.

No. IV.—On the morning of the 16th a depression made its appearance in the Upper Saint Lawrence Valley. Its track cannot be accurately charted, but it moved slowly eastward through the Gulf of Saint Lawrence during the 16th, 17th, and 18th, causing local rains in the maritime provinces and New England on all three dates. At midnight of the 19th the weather had cleared and the pressure somewhat recovered in both districts. The barometer, however, remained below the normal in all districts in the United States, excepting the North Pacific. At this report low-area No. IV made its appearance in Ontario, being central north of Rockliffe; barometer 28.58. Moving southeastward the depression was central north of Montreal; barometer 0.37 inch below the normal. At midnight of the 20th threatening weather and rain prevailed in New England, the Lower Lake region and the Saint Lawrence Valley. At midnight of the 21st it was central south of Eastport; barometer 0.37 inch below the normal. Continuing to move eastward, it was southeast of Nova Scotia on the afternoon of the 22d. The track of the depression now recurved to the northeastward, and it disappeared by midnight of the 23d, until which time local rains continued in New England and the maritime provinces. Cautionary signals were ordered up at midnight of the 20th at Cape May, Delaware Breakwater, and Chincoteague. They were lowered on the morning of the 21st, having been justified by maximum velocities of W. 31 miles at Cape May and Delaware Breakwater, and NE. 33 miles at Chincoteague. The latter signal was ordered late.

No. V.—Appeared in Dakota on the afternoon of the 19th; Deadwood barometer 0.37 inch below the normal. The pressures were below the normal at this report in all districts in the United States excepting the Northern and Middle Pacific coast regions. Moving southeastward the depression was central near Yankton on the afternoon of the 20th; Yankton barometer 0.53 inch below the normal. At this report the winds in the Northwest and the Upper Lake region were under its influence, and local rains were reported from the Upper Lake region and the Upper Mississippi Valley. During the night of the 20th and during the 21st the depression moved eastward, causing numerous rains in the Northwest and the Upper Lake region, and at midnight of the 21st was south of Chicago. On the morning of the 22d was south of Toledo, and at the afternoon report was west of Norfolk; thence it moved southeastward; was south of Cape Hatteras on the morning of the 23d; disappeared by the afternoon report. This depression caused heavy rains in the Ohio Valley on the 21st and in the South Atlantic States during the night of the 22d and morning of the 23d. Cautionary signals were ordered at Toledo and Sandusky on the morning of the 21st, and lowered at the afternoon report of the 22d, having been justified by a maximum velocity of E. 28 miles at Toledo. Signals were also ordered up from Kittyhawk to Chincoteague on the afternoon of the 22d and lowered on the afternoon of the 23d. They were justified by the following maximum velocities: Kittyhawk, SW. 32 miles; Cape Henry, NW. 28, and Chincoteague, NE. 27.

INTERNATIONAL METEOROLOGY.

International Charts Nos. V and VI accompany the present Review. The former is published for the month of May, 1879, continuing the work for that year, which was delayed after the issue of Chart No. V for the month of April, 1879, because of an intermission in the publication of the "Beobachtungen auf dem Nordatlantischen Ocean" of the "Deutsche Seewarte." The series of this chart are now complete from January, 1877, up to and including the present date. Chart No. VI is for August, 1879.

Chart No. V shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m. Washington or 0.43 p. m. Greenwich, mean time, for the month of May, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. There are two small areas of low pressure (29.80) for the present month; one situated just north of the Black Sea and the other covering Iceland, Greenland, and the surrounding ocean north of parallel 60°. The former area occupies the precise region over which one of the low areas (29.80) of May, 1877, prevailed, while the latter presents a similar comparison with the position of the area of 29.80 in May, 1878. In addition it should be said that a very small area, 29.60 (the lowest of the month), for May, 1878, lay off the northwest coast of Ireland. The pressure is generally above 29.90 throughout Asia, except in Toorkistan, where probably another area of 29.80 exists; along the Asiatic coast the pressure is generally above 29.80, although the prevailing direction of the winds would seem to indicate the presence of such an area over the ocean south of the Kamtchatka peninsula. The pressure over Hindostan ranges from 29.51 at Patna and Deesa to 29.72 at Chittagong. In the United States the area of lowest pressure, 29.90, prevails over Texas and thence northward over the Eastern Rocky Mountain slope to Dakota. In Europe this area covers a small portion of southern France, northern Italy, Austria, and southern Russia. The area of highest pressure (30.30), except at isolated stations, covers the Atlantic from 35° to 45° N., and 25° to 45° W. The area of 30.00 is common to the largest extent of territory, covering, as it does, the greater part of Europe, Algeria, the West Indies, Canada, Hudson's Bay Territory, and in the United States, the Pacific coast and that portion of the country lying east of the Mississippi. The following are the highest readings from isolated stations: Angra and Ponta Delgado, 30.28 (769.0); Funchal, 30.15 (765.7); San Luis Potosi, 30.13 (765.2); Cape Town, 30.11 (764.7); Guadalajara, 30.10 (764.4); Mexico and Fao, 30.08 (763.9); Sfax, 30.06 (763.4); Mauritius, 30.04 (762.9). The extreme monthly range of mean pressure is 0.89 inch, which is 0.29 inch larger than in May, 1878, and more than double that for May, 1877. The lowest mean temperatures given in Fahrenheit's scale were reported from the following stations: Fort St. Michaels, 26°; York Factory, 31°; Godthaab, 34°; Nikolaievsk, on the Amoor, 35°; Stykkisholm and Tromso, 42°; Yeniseisk, 44°. The highest mean temperatures were reported from the following stations: Agra, 105°; Allahabad, 104°; Lucknow and Deesa, 103°; Lahore, 101°; Fao, 91°; Manilla, 86°; Free Town and Nukuss, 85°; Bridgetown, 84°. The prevailing direction of the winds was, over the United States, northeasterly in the Middle, South Atlantic, and Eastern Gulf States; southeasterly between the 90th and 100th meridians; elsewhere variable. Over the Atlantic Ocean south of parallel 40° N., northeast east of the 40th meridian and southeast to the westward; north of 40° N., northwest east of the 40th meridian and southwest to the westward. Over Europe the winds were generally from the north and northwest, shifting to south and southwest over Italy and Austria. Over Hindostan, west and northwest, except south along the southeastern coast. Along the Asiatic coast, southeast to southwest and west. Compared with May, 1877 and 1878, there is very little change in pressure along the Pacific coast of the United States and over that country between the 80th and 100th meridians. Over the Middle Atlantic States, New England and Canada, there has been a rise of 0.05 to 0.20 inch. The temperature west of the 100th meridian compares very closely with 1878, but is from 5° to 10° lower than 1877; eastward to the Atlantic, it is generally lower as compared with either year. Over the ocean comparison can only be instituted with 1878. Between the parallels of 30° and 60° N., there has been a very marked rise in pressure, varying from 0.20 to 0.48 inch, while from 20° to 30° N., there has been a slight fall. The temperature is generally high, except off the western coast of Europe, where the fall is quite sharp. Over Europe the pressure is from 0.05 to 0.20 inch above that for May, 1878, while as compared with May, 1877, it is lower over the northwestern portion by about 0.05 inch, and over the central and southern portions little or no change. Concerning the temperature, it is from 5° to 10° warmer over northern and eastern Europe than in 1877, but closely compares with 1878; over western Europe there is a decided fall, as compared with either year, the decline extending southward into Algeria. Over British India there is a fall in pressure, as compared with either year, of from 0.05 to 0.20 inch, being most marked over the northern Provinces. The temperature, as compared with either year, is generally higher in the central and northern Provinces; elsewhere lower. Compared with the mean of the past two years, the following deviations in temperature and barometer are reported from isolated stations: York Factory, +0°.1 and +0.03 inch; Fort St. Michaels, —3°.8 and +0.23 inch; Godthaab, —2° and —0.14 inch; Stykkisholm, +2° and —0.15 inch; Tromso, +0°.2 and —0.03 inch; Thorshavn, +0°.4 and +0.12 inch; Archangel, +3°.8 and +0.13 inch; Ekaterinburg, +5° and +0.10 inch; Barnaul, —8°.9 and —0.05 inch; Yeniseisk, —4°.9 and +0.07 inch; Nikolaievsk on the Amoor, —0°.7; Valdivostock, +0°.8 and —0.02 inch; Pekin +2°.8 and —0.07 inch; Zi-Ka-Wei, +0°.5 and —0.03 inch; Tokei, +0°.7 and —0.02 inch; Tashkend, +3°.5 and —0.17 inch; Nukuss, +4°.7 and no change; Fao, compared with 1877 only, +12° and +0.05 inch; Beirut, —0°.5 and +0.02 inch; Mauritius, —2°.6 and —0.03 inch; Fort Napier, —4° and +0.08 inch; Cape Town, +4° and +0.05 inch; Free Town, —1°.5 and —0.01 inch; Paramaribo, no change and —0.03 inch; Funchal, —0°.2 and —0.05 inch; Ponta Delgado, no change and +0.22 inch; Angra, +0°.1 and —0.26 inch; Bridgetown, +2°.6 and —0.10 inch; Navassa, —1°.6; Medellin, —0°.7; San José de Costa Rica, —3°.1; Mexico, —4° and —0.01 inch; Melbourne, —0°.5 and —0.07 inch; Hobart Town, —10° and +0.08 inch.

Chart No. VI.—This chart displays the tracings of the probable courses of sixteen of the principal storm areas of the Northern Hemisphere for the month of August, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways, from the logs of vessels of the merchant marine of the North Atlantic Ocean. Unusual interest attaches to the low areas of this month, owing to the peculiar course of No. I, but more particularly to the evidences of cyclonic disturbance, as indicated in the characteristic courses of Nos. X and XIII. Concerning the general distribution of storm paths, the following is given: Six storms were confined to the territory of the United States and Canada and the neighboring waters, as included within the meridians of 60° and 100° W. and the parallels of 15° and 50° N. Two originated over the United States, but passed over the ocean to near the mainland of Europe. Two first appeared over the ocean between Greenland and northwestern Europe, passing thence northeastward and disappearing north of Russia. Three formed over the ocean southwest of the British Isles, two of which, after crossing them, passed eastward over central Europe, while the other passed northeastward north of Scotland, and after crossing northern Scandinavia, disappeared over northern Russia. Two formed over southern Russia, taking thereafter an easterly course, and one passed northeastward from the Japan Sea to the Aleutian Islands. Of the storms over North America, No. I appeared in Manitoba on the 1st, the area of low pressure extending southward into Kansas, with southerly winds thence northward; Fort Garry, 29.76, SE.; Pembina, 29.70, S. During the 2d and 3d, passed eastward over the Provinces of Ontario and Quebec attended by light rains and moderate changes in pressure. Morning of the 4th, central over the Gulf of Saint Lawrence, with light to brisk winds and occasional rains. 5th, remained about stationary, with slowly rising pressure, developing on the 6th into a very marked depression, the barometer having fallen in the past twenty-four hours from 0.15 to 0.25 inch. 7th, central off the southwestern coast of Newfoundland; Sydney, C. B., 29.31, SW.; Charlottetown, P. E. I., 29.48, NNW.; Saint John's, Newfoundland, 29.74, SE. 8th, central over the ocean to the southeast of Newfoundland; in 45° 30′ N., 50° 40′ W., 29.61; at Saint John's the barometer rose to 30.12, wind SW. 9th, passed northeastward to near 50° N., 35° W.; in 47° 35′ N., 33° 30′ W., 29.57, NW. fair; in 49° N., 30° W., 29.48, SW. fair; in 44° 34′ N., 52° 21′ W. steamship Westphalia encountered violent NNW. storm, high seas; in 48° N., 24° W., 29.74 S., force 7, light rain. 10th, in 49° 30′ N., 28° 35′ W., 29.43, N. fair; in 48° 45′

N., 27° 35′ W., 29.50, S. fair; in 51° N., 35° W., 29.74, NW., force 8, thunder-storm; in 52° N., 31° W., 29.71, NNW., force 7, drizzling; in 46° N., 27° W., 29.51, W., force 3, light rain; in 47° 35′ N., 35° 40′ W., northerly gales, heavy squalls. 11th, central in about 48° N., 18° W; during the presence of the low area off the western coast of Europe, southeast to southwest winds were superinduced, and occasional light rains prevailed over the British Isles. The southeastward progress of the depression in this latitude was checked on the 11th, and its course turned to the northwestward, probably as the result of the presence of two areas of high pressure, one over central Europe and the other situated to the south of parallel 40° N. During the day as the storm pursued its peculiar course to the west of the British Isles, extremely violent gales and heavy seas were experienced, several vessels wrecked and many badly damaged; bark St. Andrew, from New York for Dunkirk, reported violent hurricane, lost sails and cargo; steamship Ilranos, from Liverpool for New York, reported hurricane from SE. to SW., lasting ten hours, lost sails, stove bulwarks; steamship Reviewer reported most violent hurricane from SE., shifting to E. and N., with thunder and lightning and torrents of rain, confused sea from all points, lasting 8 hours, barometer fell 0.40 inch in twenty-five minutes. 12th, central in about 60° N., 30° W.; in 51° 40′ N., 28° 50′ W., heavy westerly gale, high head sea; southerly winds prevailed over the British Isles, with occasional light rains, the pressure slowly rising at southerly stations and falling over Scotland and to the northward; at Stykkisholm, barometer 29.37 SE. rain; in 55° 45′ N., 50° W., 29.66, SE. rain; at Gothaab, 29.74, SW. fair. 13th, central north of parallel 60° N. and between the meridians of 30° and 40° W.; Stykkisholm, 29.33, SE. rain; Gothaab, 29.58, W., W. fair; in 54° N., 50° W., WNW., violent hurricane, heavy rain; over the British Isles the pressure fell generally from 0.05 to 0.15 inch, with SE. to W. winds and occasional light rains. 14th, central north of Iceland, the depression spreading westward over Greenland and Baffin's Bay; Stykkisholm, 29.43, S. rain; Gothaab, 29.39, SSW. foggy; the pressure rose rapidly over the British Isles, winds shifting to westerly with clearing weather. On the 15th the winds at Gothaab and Stykkisholm still remained southerly, with rain at the latter, but rapidly rising pressure at both stations. 16th, conditions changed by the presence of low area No. VII to the southward. No. VII.—During the 10th the pressure fell quite rapidly in the Northwest and Manitoba, and by the morning of the 11th the depression was central in Minnesota; Saint Paul 29.75, SE. During the 12th and 13th passed eastward over the Upper Lakes and Canada, and on the morning of the 14th was central north of Quebec; barometer 29.53 NW., rain; Farther Point 29.84, SW., fair. 15th, probably central over Labrador, thence pursuing an easterly course over the ocean to the south of Greenland. 16th, barometer at Gothaab 29.48, a fall of 0.23 inch in past twenty-four hours, wind changed from S. to N.; Stykkisholm, 29.85, a fall of 0.15 in past twenty-four hours, atmosphere calm, wind previously from the south; in 51°, 35′ N., 50° W., 29.57, W., violent gale, heavy rain; in 52°, 25′ N., 31° W., 29.97, SE., cloudy. 17th, central in about 58° N., 40° W.; barometer below 29.60 from Labrador to the meridian of 20° W.; Gothaab, 29.47, S.; Stykkisholm. 29.82, calm; in 54° N., 22° W., 29.49, SE., heavy rain; in 50°, 45′ N., 48° W., 29.56, WNW., violent gale and rain. 18th, central in about 58° N., 30° W.; Gothaab, 29.74, calm; Stykkisholm, 29.66, SE., brisk, fair; in 55°, 35′ N., 14°, 40′ W., 29.51, SW., heavy rain; in 53° N., 34° W., 29.27, SSW, rain; at interior stations, British Isles, the pressure rose considerably, but fell along the western coast, with winds shifting to east and northeast. 19th, central in about 55° N., 20° W.; in 52° N., 36° W.; 29.41, NW., rain; in 50° N., 23°, 40′ W., 29.39, W., gale, fair; in 48° N., 34°, 35′ W., W., gale, heavy rain; the winds at Thorshavn and Stykkisholm changed from southeast, to northeast and northwest respectively, with rising pressure; over the British Isles the winds changed from northeast and east to southeast and southwest, with a variation in pressure of from +0.05 to +0.12 inch. 20th, central off the Irish coast; in 50° N., 28° W., 29.35, W., rain; in 49° N., 27° W., 29.35, SW., heavy rain; over the British Isles, cloudy, gloomy, or rainy weather with southwesterly winds prevailed, the pressure had fallen at all stations, but particularly along the western coast, where a change of from —0.15 to —0.27 inch was reported. During this day the course of the depression was changed to the north-northeast just as the conditions appeared to be favorable for its crossing the British Isles. This peculiar disposition of pressure in the progressive movement of the central area, viz: to skirt the coast of western Europe, characterized the low area throughout the remainder of its course, which bounded Scandinavia to the west and north. It is of importance to note in connection herewith that on the 20th an area of high pressure (over 30.00) formed over central Europe, and moved in a parallel course with the low area, to the northeastward. On the 23d this high pressure covered central Russia with an area of over 30.10. 21st, depression central off the west coast of Scotland; in 51° N., 18° W., 29.27, SW., cloudy; Thorshavn, 29.43, NE., fair; Galway, 29.42, S., cloudy; Valencia, 29.43, SSE., misty. 22d, central north of Scotland; pressure fell very rapidly at all northern stations in the British Isles, but rose slowly to the southward with winds shifting from south to southwest and west; lowest pressures as follows: Thorshavn, 29.20, W.; North Unst, 29.22, SW.; Nairn, 29.26, SW.; Sandwick Manse, 29.27, SW.; Ardrossan, 29.33, SSW. 23d, during the day, and with much diminished pressure, the depression passed northeastward along the western coast of Norway, and on the morning of the 24th was central north of Tromso, barometer 29.24, wind SW; southwesterly winds with falling barometer prevailed over Scandinavia. 25th, central north of the White Sea, the area of 29.40 extending eastward from northern Norway to the meridian of 90° E., and southward to parallel 60° N.; Tromso, 29.25, SW.; Archangel, 29.47, WNW.; Yeniseisk, 29.45, SE.; Barnaul, 29.44, SW. 26th, pressure rose rapidly at all stations abovenamed, but direction of wind remained the same except at Barnaul, which changed to northwest. No. IV.—Since the 4th the pressure had been generally below the normal over the United States between the 80th and 100th meridians, with no well defined area of depression. During the 6th a decided fall in barometer took place over Lake Superior and to the northward, followed by brisk southerly winds over Upper Lake region, Tennessee, and the Ohio Valley. On the morning of the 7th depression was apparently central over Lake Huron; Alpena barometer 0.23 inch below the normal. 8th, central near Quebec with a barometric trough below 29.80 extending southward to Virginia. During this day and the following the depression passed northeastward beyond the Gulf of Saint Lawrence, disappearing in a high pressure area then prevailing over the ocean to the south of Greenland. No. VI.—This area developed on the 8th off the North Carolina coast. Only slight evidence of its existence was shown from stations along the South Atlantic coast, the pressure having fallen about 0.04 inch in the past twenty-four hours. The winds were southwest and west, accompanied by occasional light rains. In the vicinity of 34° N., 70° W., the winds were southeast to southwest, brisk, with rainy or threatening weather; barometer about 29.75. On this date the centers of two other depressions (Nos. I and IV) were located to the north and northwest, one in the lower Saint Lawrence valley and the other in about 45° N., 48° W. This disposition of pressure gave existence to a most irregular and peculiar shaped area of low (29.80), running from near the northwestern coast of Ireland southwestward to latitude 40° N., and thence west-southwest within much narrower limits to the New Jersey and Massachusetts coasts, from which locality it extended northward between the meridians of 70° and 80° W. over Canada and Hudson's Bay. This irregular elongated area of depression was bounded to the north and south by areas of high pressure, over Newfoundland above 30.10, and over the Azores above 30.20. 9th, area central, with more decided form, in about 38° N., 70° W.; in 37° N., 62° W., 29.95, violent SW. gale, heavy rain; in 42° N., 60° W., 29.86, SSE., brisk, heavy rain; in 38° N., 72° W., 29.90, N., brisk, fair; off Cape Hatteras, violent SW. and W. squalls with high seas; along the Atlantic coast from Wilmington to Boston west to northwest winds prevailed with pressures generally below 29.90. 10th, central south of Nova Scotia, but depression extended southwestward below parallel 40° N.; in 39° N., 67° W., 29.82, SW., brisk, fair; along the Middle Atlantic and New England coasts winds shifted to northerly (brisk to high) with rising pressure; off Cape Hatteras bark Grace Bradley experienced terrific gale from the north, lasting six hours, and finally settling into a heavy northeast gale with tremendous high sea, decks swept of everything. 11th, rain with north to west winds and rising pressure (generally above 30.00) prevailed over the ocean southeast of Nova Scotia; in 41°, 56′ N., 61°, 06′ W., ship Prince Louis experienced short hurricane or whirlwind, commenced at east-southeast and shifted suddenly to southwest and then northwest, lasting three hours; lost sails and mast, leaving the ship helpless; two seamen washed overboard, in 41°, 20′ N., 64° W., ship Antoinette reported violent southeast to northeast gale; vessel foundered at 6.30 p. m. Rain or threatening weather with brisk to high southwest to northwest winds prevailed over the ocean south of Newfoundland on the 14th, during which time several vessels experienced very rough handling and much damage to masts and sails. No. X.—Considerable interest attaches to the development and progress of this depression because of its cyclonic action, the unusually large number of vessels wrecked and the remarkable narrowness of the area of atmospheric disturbance. On the 14th the area appeared to be central over the Caribbean Sea, south of Porto Rico; in fact, from the disposition of surrounding pressure it appears highly probable that the area originated within this natural amphitheater formed by the Western Antilles to the north, the Lesser Antilles to the east, and the Leeward Islands to the south. Over the ocean north of parallel 20° an area of high pressure from 30.00 to 30.20 prevailed, and south of parallel 10° an area of 30.00 to 30.10. At Bridgetown, Barbadoes, barometer 20.98, a rise of 0.05 inch in past twenty-four hours, wind shifted from NE. to E.; Fort de France, Martinique, 29.81, no change in past forty-eight hours, barometer morning of the 11th, 29.83; San Juan de Porto Rico, 29.95, a fall of 0.07 inch in past twenty-four hours, wind shifted from SE. to E.; in 18° N. 64° W., 29.56, a fall of 0.08 inch in past twenty-four hours, wind shifted from E. to NE. Stations in advance of the immediate centre of depression reported as follows: Navassa, 20.93 or —0.05 inch in past twenty-four hours, wind steady from the east since the 1st; Kingston, Jamaica, 30.13 or —0.06 inch in past twenty-four hours, winds shifted from N. to NW. 15th, probably central south of Saint Domingo; San Juan de Porto Rico, 30.01, SE., rain; Fort de France, 29.87; Bridgetown, 29.96, NE. with increasing force; Santiago de Cuba, 29.97, N., light; Navassa, 29.93, NE.; Kingston, 30.14, NE. 16th, central south of Santiago de Cuba, barometer 29.96, occasional heavy showers fell during the day with squalls from the southeast, at midnight barometer rose to 29.99, atmosphére calm; in 19° 45′ N., 75° 50′ W., steamship Pomona experienced hurricane from NE. to SSW., blowing with great violence, accompanied by heavy cross-seas lasting thirteen hours, after which moderated to a gale with heavy rain squalls; Navassa, 29.90, E.; Kingston, 30.11, SE.; Nassau, Bahamas, 29.87, or —0.12 inch in past twenty-four hours, wind shifted from SE. to N.; Grand Turk, Bahamas, 29.90, or +0.15 inch in past twenty-four hours, winds shifted from NE. to SE.; twenty miles east of Watling's Island, Bahamas, brig Dashaway had severe hurricane from NE. to SE. and S., lasting ten hours. 17th, central north of Nassau, barometer 29.86, S., heavy rain; Grand Turk, 29.90, SE., strong; Santiago de Cuba, 29.92, NE., fair; Navassa, 29.90, NE., cloudy; Havana, 29.88, or —0.05 inch in past twenty-four hours, atmosphere calm, wind previous day from the SE.; at all Florida stations the wind shifted from SE. and E. to N. and NW., with falling barometer. At this point it is of interest to call attention to the comparatively slight changes in pressure at all stations heretofore named, indicating their position as on the outskirts of the depression which was previously referred to respecting its narrow diameter. During the 17th the depression passed northward in a course curving slightly to the east, path about two hundred miles off the Florida and South Atlantic coasts. 17th, in 31° 45′ N., 79° W., schooner C. Berry, about 11 p. m., struck terrific hurricane from NNE., accompanied with tremendous sea and rain; in 41° N., 68° W., steamship Metcalf, violent hurricane from SE., veering suddenly to NE., lasting three hours; in 31° N., 78° 30′ W., 10 p. m., schooner Drummond struck cyclone accompanied by heavy cross-seas, vessel on beam-ends for two hours; in 29° N., 78° 30′ W., hurricane from SSE., decks swept. 18th, 6.30 a. m., central on the North Carolina coast, Cape Lookout 29.15 or 0.84 inch below the normal, wind SE., 138 miles per hour; at other coast stations the wind velocities ranged from 68 to 100 miles per hour. In 32° N., 72° W., hurricane from SSE. to WNW., lasting twelve hours and blowing fearfully in squalls. About 200 miles north of Chincoteague, steamship Johns Hopkins reported the following observations: 12.30 p. m., 29.95, SSE.; 1 p. m., 29.80, SE. and S., brisk; 1.30 p. m., 29.65, ESE., gale; 2 p. m., 29.05, E., gale; 2.30 p. m., 28.90, calm for twenty minutes; 2.45 p. m., barometer rising, wind NNW. with great fury; 5 p. m., moderate weather. Steamship Lord Clive, in about 39° N., 73° W., 8 a. m., 30.02, rain; 10 a. m., 29.90, ENE., light; noon, 29.80, strong breeze, heavy rain, rising sea; 2 p. m., 29.60, NE., tremendous high sea; 3 p. m., slowed engines and put ship's head to the eastward; 4 p. m., 29.44, NNE., hurricane, blinding rain, high confused sea; 5 p. m., 29.60, wind suddenly flew into the NW. with fearful violence and high-cross seas; 6 p. m., ditto; 8 p. m., gale moderating, clear to the NW., sea going down, ship's head put to the westward; 9.30 p. m., Absecum Light abeam, sea moderating; midnight, 29.90, moderate west breeze. About 15 miles NE. of Cape Henlopen, schooner Sea Bird, 5.30 p. m., struck hurricane and was carried 50 miles south. Ten miles south of Vineyard, schooner Skylark encountered heavy gale from E., veering around to NW., in which vessel scud under bare poles for thirteen hours. Off Chincoteague, steamship Lucretia, NE. veering to NW. violent gale, heavy rains and high seas. About 30 miles SE. of Five-fathom Bank Lightship, bark E. J. McManerray, from Havana to New York, August 20th, experienced fine weather to the 18th, when barometer began to fall rapidly, wind SE., rain in torrents; 2 p. m., wind ceased at SE., leaving a terrific sea, suddenly wind came from NNW., carrying away portion of masts and sails; for two hours vessel in a perfect cyclone and literally submerged. Twenty miles east of Sandy Hook, violent hurricane from ENE. to NW., lasting eight hours. Off Nantucket, violent SE. gale, lasting ten hours. Forty miles east of Cape Cod, heavy NE. gale, lasting eight hours. Thirty miles off Sandy Hook, steamship Reindeer, heavy NE. gale, lasting eight hours, lost masts and bulwarks, decks completely under water for five hours. 19th, 7.35 a. m., central south of Eastport, barometer 29.30, or 0.07 inch below the normal, lowest, 29.16 at 11.15 a. m., wind NE., 34 miles; the winds along the New England coast veered from E. to S. and NW., with velocities ranging from 25 to 60 miles per hour. In 38° 29′ N., 74° 16′ W., steamship Holbrook encountered the end of a hurricane, wind blowing from NW. to NE., changing suddenly, sea terrific, decks swept. Thirty miles south of Gay Head, near Vineyard Haven, 6 p. m., hurricane, carrying away sails and small boats; lay to for about two hours with lee rail under water and sea washing deck. In 42° 50′ N., 67° 45′ W., schooner J. W. Nickerson, terrific cyclone for sixteen hours. In 42° 38′ N., 65° 20′ W., steamship Memento, revolving gale from SW. to NW. with heavy cross-seas, lasting twelve hours. In 41° N., 65° 56′ W., violent SW. gale and high seas for twenty hours. Sixty miles south of Cape Sable, fearful SE. gale, decks swept. In 34° N., 73° 30′ W., terrific gale from ESE. to NW. In 42° N., 63° W., violent SW. to W. and NW. gale and high seas. In 42° N., 79° W., violent SE. to SW. and W. gale, tremendous high sea. 20th, 7.35 a. m., central south of Newfoundland, depression slowly filling up. From Maine eastward to Cape Breton Island the winds were NW. and N., pressure ranging from 29.54 to 29.90, lowest at Sydney, C. B.; over Newfoundland and southeastward to 50° W., winds, SE., barometer 29.76 to 29.94. 21st, passed eastward beyond 50° W., combining with an area of 29.80, then prevailing over the ocean in the region of parallel 50° N. and forming a part of low area No. VII, then central off the Irish coast. No. XII.—With the pressure below the normal over the Southeast Rocky Mountain slope and Texas since the 13th, the area appeared central in Indian Territory on the morning of the 15th; thence its course was northeastward over Tennessee and the Ohio Valley to central New York, where on the morning of the 17th it appeared to be about stationary, with NE. to SE. and S. winds and rain along the Middle Atlantic coast. On the 18th these winds had changed to N. and NW., with a slight rise in pressure, rain continuing, but more general and heavy, owing to the advance of low area No. X, then on the North Carolina coast. No. XIV.—On the 20th from the Saskatchewan Valley southward to New Mexico, an area of low pressure, generally below 29.80, prevailed. By the 21st this area had taken more decided form and was central in Minnesota, lowest barometer at Breckinridge, 29.54. 22d, central over Lake Michigan, Escanaba 29.52, or 0.42 inch below the normal. During the 23d and 24th depression remained about stationary in the Lower Saint Lawrence Valley, accompanied by light rains and east to south winds, fresh to brisk. 25th, depression passed southeastward off the Nova Scotia coast, followed over the maritime provinces by NE. to NW. winds and rising pressure. No. XIII.—This storm, like No. X, possesses throughout portions of its course the characteristics of a tropical cyclone, but lacks decidedly in the extraordinary power manifested by the latter. On the 20th, the pressure fell over the southern portion of the Gulf of Mexico as indicated by the barometer readings at Havana and Tlacotalpan, the former 29.87, and the latter 29.85, a fall at both stations of 0.02 inch in past twenty-four hours. Fifty miles east of Alacran Reef, off the northern coast of Yucatan Peninsula, bark Elvina encountered violent cyclone from ENE., which ended on the following day at 4 p. m., with wind SSE.; very high seas and terrific squalls were experienced as the vessel passed to the westward; considerable damage was reported from the vicinity of Progreso on the northwestern coast of Yucatan, and also along the Bay of Campeachy. 21st, pressure fell considerably at all Gulf stations, and high NE. to NW. winds were anticipated along the northern coast. At Tlacotalpan barometer 29.79, a fall of 0.06 inch in past twenty-four hours, wind shifted from N. to W. with heavy rain, 2.37 inches in past twenty-four hours. 22d, central south of Galveston, the pressure falling rapidly along the northern Gulf coast, giving a variation of from —0.15 to —0.24 inch in past twenty-four hours; the rainfalls were unusually heavy and the winds mostly from the north, increased to high. 23d, central in eastern Texas, where the pressure was generally below 29.50, lowest barometer at Shreveport 29.31; very heavy rainfalls, but no dangerous winds, so far as reported, accompanied the progress of the area on this day. During the 24th and 25th, the depression passed northeastward over Tennessee and the Ohio Valley, accompanied by quite decided changes in pressure, northeast to northwest winds and occasionally heavy rains. On the morning of the 26th central on the North Carolina coast, where brisk to high NW. to SW. winds were reported, pressure generally below 29.80. During this day and the following passed eastward to near the 70th meridian and thence northeastward to parallel 40° N. 28th, in 38° N., 71° W., 29.92 NE., high, fair; in 40° 30′ N., 67° 40′ W., 29.90 E., high, heavy rain; in 43° N., 64° 45′ W., 29.95 NE., brisk, fair. 29th, central south of Nova Scotia, with SE. to N. winds and rain over the maritime provinces. In 42° 30′ N., 63° 45′ W., 29.65, NE., rain; in 40° 35′ N., 66° 25′ W., 29.92, NNW., fair; in 41° N., 62° W., 29.75, SW., gale, thunder-storm; in 43° N., 60° W., 29.76 SSW., brisk, rain and lightning; in 40° N., 69° W., 30.10, NW., gale. During the 30th and 31st, passed northeastward south of Newfoundland, combining with an area of 29.80, then prevailing over the ocean in the vicinity of parallel 50° N.

Of the storms confined to the ocean northwest of the British Isles, No. II appeared on the 1st in about 60° N., 10° W.; Thorshavn, 29.66, NE.; Stykkisholm, 29.93, NW.; Sandwick Manse, 29.54, W. 2d, central north of Scotland; Thorshavn, 29.47, N.; Sandwick Manse, 29.95, WSW.; pressure rose rapidly over northern Scotland, with winds shifting to SW. During the passage of this storm northeastward, the pressure remained generally above 30.00 over the central and southern portions of the British Isles, with clear or partly cloudy weather and W. to NW. winds. During the 2d, depression passed rapidly northeastward along the western coast of Norway, affecting the pressure very slightly at coast stations, and on the morning of the 3d appeared to be central north of

APPENDIX 76.

MONTHLY WEATHER REVIEW, JULY, 1881.

INTRODUCTION.

In preparing this review the following data, received up to August 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 151 monthly journals and 174 monthly means from the former, and 15 monthly means from the latter; 213 monthly registers from voluntary observers; 54 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of July, 1881, is shown by isobaric lines (in black) upon Chart No. II. The area of lowest pressure covers the Canadian Maritime Provinces, and the areas of high the Gulf States, Tennessee, the Upper Mississippi and Lower Missouri Valleys, and the Northern Pacific coast region. Within the same parallels the pressure is quite evenly distributed over the country east of the 100th meridian. Compared with the preceding month, the pressure is generally higher over the entire country, the increase ranging from 0.01 to 0.13 inch. The regions of greatest change are found in the States bordering the Mississippi River and along the Northern Pacific coast.

Departures from the normal values for the month.—Compared with the means for previous years, the mean pressure of the present month is below the average at all stations east of the boundary formed by the junction of the Mississippi and Ohio Rivers, the western line of Pennsylvania and the eastern shores of Lakes Erie and Ontario, and the Saint Lawrence River. Westward of this boundary to, and including the Pacific coast regions, the pressure is generally above the mean. Within no district over the country do the departures indicate an unusual variation from the mean, the general range being from normal to 0.10 inch, the latter reported from only two stations, New London and Wilmington, and normal from Galveston, Brownsville, Tex.; Punta Rassa, Denison, Tex.; Louisville and Denver. The regions of greatest departure are the Atlantic coast States from Jacksonville to Eastport, the Upper Lake region, Minnesota and California, showing a variation of from 0.04 to 0.10 inch. The regions of least departure are the Gulf coast, Tennessee and the Ohio Valley, ranging from normal to 0.02 inch.

Barometric ranges.—The range of pressure for the month has in general varied from 0.4 to 0.6 inch, and in the extremes from 0.16 inch at Fort Davis, Texas, to 0.97 inch at Eastport. Throughout the several districts the monthly barometric range varied as follows: New England, 0.74 inch at New Haven to 0.97 inch at Eastport; Middle Atlantic States, 0.52 at Delaware Breakwater to 0.76 at Albany; South Atlantic States, 0.39 at Jacksonville to 0.59 at Macon and Kittykawk; Eastern Gulf States, 0.26 at Key West to 0.36 at Pensacola; Western Gulf States, 0.25 at Indianola and Galveston to 0.43 at Fort Gibson; Rio Grande Valley, 0.25 at Eagle Pass to 0.30 at Brackettville; Ohio Valley and Tennessee, 0.35 at Memphis to 0.67 at Columbus; Lower Lake region, 0.50 at Cleveland to 0.67 at Oswego; Upper Lake region, 0.54 at Port Huron to 0.68 at Marquette; Upper Mississippi Valley, 0.42 at Cairo to 0.66 at Des Moines; Missouri Valley, 0.58 at Leavenworth to 0.72 at Fort Bennett; extreme Northwest, 0.62 at Fort Buford to 0.78 at Saint Vincent; Northern Slope, 0.44 at Cheyenne to 0.61 at Fort Keogh; Middle Slope, 0.35 at Fort Elliott to 0.56 at Dodge City; Southern Slope, 0.16 at Fort Davis to 0.41 at Fort Griffin; Northern Plateau, 0.54 at Eagle Rock to 0.73 at Lewiston; Middle Plateau, 0.41 at Pioche to 0.54 at Salt Lake City; Southern Plateau, 0.19 at Silver City to 0.43 at Phœnix; North Pacific coast, 0.49 at Roseburg to 0.52 at Portland; Middle Pacific coast, 0.37 at San Francisco to 0.52 at Red Bluff; South Pacific coast, 0.24 at San Diego to 0.42 at Yuma.

Areas of high barometer.—Four such areas have been sufficiently important during the month of July, 1881, to merit description.

No. I.—This area, which was partly described in the June Review as high area No. VI, was present in the Upper Lake region on the morning of the 1st as an area of 30.2. Northerly winds prevailed in the Lake region, New England, and the Middle Atlantic States, with clear weather, and southerly winds and threatening weather in the South Atlantic States. By the afternoon reports, the winds in the South Atlantic States had shifted to northeasterly, and heavy rains were reported from that district and the East Gulf States, and local rains from the Ohio Valley and Tennessee. The temperature fell during the 1st from 4° to 12° at stations in the South Atlantic and Gulf States, and rose slightly in the Lower Lake region. The area moved slowly southeastward during the 1st and 2d, and on the morning of the 3d was central in Tennessee. During the 2d the winds in the Lake region, New England, and the Middle Atlantic States backed to southwesterly, and the temperature rose decidedly in all but the latter district, in which it remained nearly stationary. The weather cleared in the South Atlantic and Gulf States, and on the morning of the 3d fair weather prevailed in all districts east of the Mississippi River and in the Northwest. During the 3d the area remained nearly stationary, the pressure increasing slightly in the Gulf States and decreasing slowly, with rising temperature, in the Northwest, and thence eastward to the Atlantic coast. During the 4th the high barometer moved slowly southward, and during the 5th and 6th was central as an area of 30.1 in the Gulf States; after the latter date it ceased to have any marked influence on the weather conditions. The minimum temperatures for the month were caused by this area at many of the stations in the Lake region, the Ohio Valley and Tennessee on the 1st and 2d; in the Middle Atlantic States on the 2d and 3d, and in the South Atlantic States on the 3d and 4th. Cautionary signals were displayed on the Atlantic coast from Cape Henry, Va., to Macon, N. C., on the morning of the 1st in anticipation of northeasterly winds. They were lowered at midnight of the 2d, having been partly justified by the following maximum velocities: Cape Henry, NE. 25 miles; Kittyhawk, NE. 34; Cape Hatteras, NE. 28, and Macon, N. 28.

No. II.—On the morning of the 8th low area No. II was central in Manitoba, and the pressures in the Northwest were below the mean—Omaha barometer 0.25 inch below the normal. During the 8th and 9th the pressures rose rapidly in the extreme Northwest and in the Lower Missouri and Upper Mississippi Valleys in rear of the depression which moved eastward north of the latter district. The high area moved slowly eastward across the Lakes during the 9th and 10th, causing local rains in the Lake region on the 10th and 11th, and in New England on the latter date. The minimum temperatures for the month at stations in the Upper Missouri Valley occurred on the 8th and 9th.

No. III.—During the night of the 20th and morning of the 21st the barometer rose rapidly in all districts west of the Mississippi River, and on the afternoon of the latter date an area of high barometer made its appearance in Montana, Fort Shaw barometer 0.27 inch, and Fort Buford barometer 0.26 inch above the mean. Low area No. V was then central in the Upper Mississippi Valley near La Crosse. The pressures west of the Mississippi continued to increase slowly until the 24th, the high barometer remaining nearly stationary. On the 25th and 26th the barometer fell slowly on the Pacific coast but rose slightly in the Northwest, and at the afternoon report of the latter date the high area was central in the Upper Mississippi Valley, in which district and in the Lake region the pressures gradually increased until the 29th, when the barometer was above the normal in all districts east of the Mississippi River, excepting the South Atlantic and East Gulf States, and the high area became merged in area No. IV, which was then southeast of New England. The minimum temperatures for the month occurred in connection with this area in the Lower Missouri and Upper Mississippi Valleys on the 26th and 27th.

No. IV.—At midnight of the 27th the pressures were below the mean in New England and the Lower Lake region, and the Middle and South Atlantic and Gulf States. The pressures increased slowly in the Middle and South Atlantic States and rapidly in New England and the maritime provinces during the 28th, and in the two latter districts were slightly above mean at midnight. Easterly winds prevailed in New England and the maritime provinces. This pressure continued to increase rapidly in these districts during the 29th, with easterly winds in the former and southwesterly winds in the latter district. Local rains were reported from both districts, followed by clearing weather in the maritime provinces during the afternoon, and in New England during the night. The barometer on the morning of the 30th was from 0.3 to 0.4 inch above the mean in New England and the maritime provinces, and local rains were reported from the North Carolina coast. The area of high barometer remained nearly stationary southeast of New England during the 30th and 31st, the pressures slowly increasing in the Middle and South Atlantic States, and falling slowly in the Saint Lawrence Valley and in the Gulf; at midnight of the latter date the barometer was still 0.23 inch above the mean in New England. Rain continued in the Middle and South Atlantic States during the 30th and 31st, clearing in the former district on the 31st. Cautionary signals were ordered on the morning of the 30th from Sandy Hook, N. J., to Macon, N. C. They were lowered from Cape May to Cape Henry at the afternoon report of the 30th; at Atlantic City, Barnegat, and Sandy Hook at midnight, and on the morning of the 31st at Kittyhawk, Hatteras, and Macon. They were justified by the following maximum velocities: Hatteras, SE. 33 miles; Kittyhawk, E. 36; Chincoteague, E. 25; Delaware Breakwater, NE. 31; Atlantic City, NE. 25, and Sandy Hook, E. 32.

Areas of low barometer.—Five such areas have been charted for the month of July, 1881. None of them exhibited special energy.

No. I.—During the 3d the pressure decreased slowly in the extreme Northwest, and at midnight a depression was central in the Saskatchewan Valley; Fort Stevenson, barometer 0.32 inch below the normal. High area No. I was then central in Tennessee. The temperature had risen in the Northwest, the Lake region, the Ohio Valley, and New England. Light rains were reported from the Northern Rocky Mountain slope. The depression moved slowly eastward north of the Lakes, and at midnight of the 5th was central north of Montreal; thence pursuing a southeasterly course across New England, it was east of Boston in the morning of the 6th, and had disappeared by the afternoon of the same date. This depression was unaccompanied by precipitation in the Northwest and the Lake region, but caused light rains in New England and the maritime provinces on the 5th. Cautionary signals were displayed in advance of this depression at stations on Lakes Michigan and Superior. They were not justified. The maximum temperatures for the month at a majority of the stations in the Middle Atlantic States and southern portion of New England occurred in connection with this area on the 6th.

No. II.—During the 6th the barometer fell decidedly over the Northern Slope and Plateau regions, and in the afternoon an area of low barometer was apparently central in the Saskatchewan Valley, although the barometer remained slightly above the mean in all districts in the United States except on the immediate Atlantic coast. Owing to missing reports the track of the depression cannot be accurately charted during the next two days, but the barometer continued to fall in the Northwest, and the depression moved slowly eastward, and at midnight of the 7th was northwest of Fort Garry; Bismarck, barometer 0.45 inch below the normal. On the afternoon of the 8th it was north of Lake Superior; Duluth, barometer 0.28 inch below the normal. During the 8th, 9th, and 10th it continued its eastward movement north of the Lakes and through the Saint Lawrence Valley, and disappeared by the afternoon of the 11th.

No. III appeared over the Northern Slope on the 11th, and at the afternoon report was central near Deadwood; barometer 0.24 inch below the normal. Local rains were reported from stations in the extreme Northwest. Moving slowly eastward the depression was north of Lake Superior on the morning of the 12th; Marquette, barometer 0.26 inch below the normal. Heavy rains were reported from the Upper Lake region. It continued to move eastward north of the Lakes, causing general rains in the Lake region and occasional thunder-storms in the Mississippi Valley; at midnight it was north of Rockliffe; Kingston, barometer 0.16 inch below the normal. Numerous rains were reported from the Middle Atlantic States on the 13th, and at midnight the depression was west of Chatham; thence it moved eastward off the Atlantic coast. Pressures in the maritime provinces remained below the normal until the 18th, when they gradually recovered. No cautionary signals were ordered for this depression.

No. IV.—On the morning of the 16th a depression made its appearance in the Upper Saint Lawrence Valley. Its track cannot be accurately charted, but it moved slowly eastward through the Gulf of Saint Lawrence during the 16th, 17th, and 18th, causing local rains in the maritime provinces and New England on all three dates. At midnight of the 19th the weather had cleared and the pressure somewhat recovered in both districts. The barometer, however, remained below the normal in all districts in the United States, excepting the North Pacific. At this report low-area No. IV made its appearance in Ontario, being central north of Rockliffe; barometer 28.58. Moving southeastward the depression was central north of Montreal; barometer 0.37 inch below the normal. At midnight of the 20th threatening weather and rain prevailed in New England, the Lower Lake region and the Saint Lawrence Valley. At midnight of the 21st it was central south of Eastport; barometer 0.37 inch below the normal. Continuing to move eastward, it was southeast of Nova Scotia on the afternoon of the 22d. The track of the depression now recurved to the northeastward, and it disappeared by midnight of the 23d, until which time local rains continued in New England and the maritime provinces. Cautionary signals were ordered up at midnight of the 20th at Cape May, Delaware Breakwater, and Chincoteague. They were lowered on the morning of the 21st, having been justified by maximum velocities of W. 31 miles at Cape May and Delaware Breakwater, and NE. 33 miles at Chincoteague. The latter signal was ordered late.

No. V.—Appeared in Dakota on the afternoon of the 19th; Deadwood barometer 0.37 inch below the normal. The pressures were below the normal at this report in all districts in the United States excepting the Northern and Middle Pacific coast regions. Moving southeastward the depression was central near Yankton on the afternoon of the 20th; Yankton barometer 0.53 inch below the normal. At this report the winds in the Northwest and the Upper Lake region were under its influence, and local rains were reported from the Upper Lake region and the Upper Mississippi Valley. During the night of the 20th and during the 21st the depression moved eastward, causing numerous rains in the Northwest and the Upper Lake region, and at midnight of the 21st was south of Chicago. On the morning of the 22d was south of Toledo, and at the afternoon report was west of Norfolk; thence it moved southeastward; was south of Cape Hatteras on the morning of the 23d; disappeared by the afternoon report. This depression caused heavy rains in the Ohio Valley on the 21st and in the South Atlantic States during the night of the 22d and morning of the 23d. Cautionary signals were ordered at Toledo and Sandusky on the morning of the 21st, and lowered at the afternoon report of the 22d, having been justified by a maximum velocity of E. 28 miles at Toledo. Signals were also ordered up from Kittyhawk to Chincoteague on the afternoon of the 22d and lowered on the afternoon of the 23d. They were justified by the following maximum velocities: Kittyhawk, SW. 32 miles; Cape Henry, NW. 28, and Chincoteague, NE. 27.

INTERNATIONAL METEOROLOGY.

International Charts Nos. V and VI accompany the present Review. The former is published for the month of May, 1879, continuing the work for that year, which was delayed after the issue of Chart No. V for the month of April, 1879, because of an intermission in the publication of the "Beobachtungen auf dem Nordatlantischen Ocean" of the "Deutsche Seewarte." The series of this chart are now complete from January, 1877, up to and including the present date. Chart No. VI is for August, 1879.

Chart No. V shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m. Washington or 0.43 p. m. Greenwich, mean time, for the month of May, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. There are two small areas of low pressure (29.80) for the present month; one situated just north of the Black Sea and the other covering Iceland, Greenland, and the surrounding ocean north of parallel 60°. The former area occupies the precise region over which one of the low areas (29.80) of May, 1877, prevailed, while the latter presents a similar comparison with the position of the area of 29.80 in May, 1878. In addition it should be said that a very small area, 29.60 (the lowest of the month), for May, 1878, lay off the northwest coast of Ireland. The pressure is generally above 29.90 throughout Asia, except in Toorkistan, where probably another area of 29.80 exists; along the Asiatic coast the pressure is generally above 29.80, although the prevailing direction of the winds would seem to indicate the presence of such an area over the ocean south of the Kamtchatka peninsula. The pressure over Hindostan ranges from 29.51 at Patna and Deesa to 29.72 at Chittagong. In the United States the area of lowest pressure, 29.90, prevails over Texas and thence northward over the Eastern Rocky Mountain slope to Dakota. In Europe this area covers a small portion of southern France, northern Italy, Austria, and southern Russia. The area of highest pressure (30.30), except at isolated stations, covers the Atlantic from 35° to 45° N., and 25° to 45° W. The area of 30.00 is common to the largest extent of territory, covering, as it does, the greater part of Europe, Algeria, the West Indies, Canada, Hudson's Bay Territory, and in the United States, the Pacific coast and that portion of the country lying east of the Mississippi. The following are the highest readings from isolated stations: Angra and Ponta Delgado, 30.28 (769.0); Funchal, 30.15 (765.7); San Luis Potosi, 30.13 (765.2); Cape Town, 30.11 (764.7); Guadalajara, 30.10 (764.4); Mexico and Fao, 30.08 (763.9); Sfax, 30.06 (763.4); Mauritius, 30.04 (762.9). The extreme monthly range of mean pressure is 0.89 inch, which is 0.29 inch larger than in May, 1878, and more than double that for May, 1877. The lowest mean temperatures given in Fahrenheit's scale were reported from the following stations: Fort St. Michaels, 26°; York Factory, 31°; Godthaab, 34°; Nikolaievsk, on the Amoor, 35°; Stykkisholm and Tromso, 42°; Yeniseisk, 44°. The highest mean temperatures were reported from the following stations: Agra, 105°; Allahabad, 104°; Lucknow and Deesa, 103°; Lahore, 101°; Fao, 91°; Manilla, 86°; Free Town and Nukuss, 85°; Bridgetown, 84°. The prevailing direction of the winds was, over the United States, northeasterly in the Middle, South Atlantic, and Eastern Gulf States; southeasterly between the 90th and 100th meridians; elsewhere variable. Over the Atlantic Ocean south of parallel 40° N., northeast east of the 40th meridian and southeast to the westward; north of 40° N., northwest east of the 40th meridian and southwest to the westward. Over Europe the winds were generally from the north and northwest, shifting to south and southwest over Italy and Austria. Over Hindostan, west and northwest, except south along the southeastern coast. Along the Asiatic coast, southeast to southwest and west. Compared with May, 1877 and 1878, there is very little change in pressure along the Pacific coast of the United States and over that country between the 80th and 100th meridians. Over the Middle Atlantic States, New England and Canada, there has been a rise of 0.05 to 0.20 inch. The temperature west of the 100th meridian compares very closely with 1878, but is from 5° to 10° lower than 1877; eastward to the Atlantic, it is generally lower as compared with either year. Over the ocean comparison can only be instituted with 1878. Between the parallels of 30° and 60° N., there has been a very marked rise in pressure, varying from 0.20 to 0.48 inch, while from 20° to 30° N., there has been a slight fall. The temperature is generally high, except off the western coast of Europe, where the fall is quite sharp. Over Europe the pressure is from 0.05 to 0.20 inch above that for May, 1878, while as compared with May, 1877, it is lower over the northwestern portion by about 0.05 inch, and over the central and southern portions little or no change. Concerning the temperature, it is from 5° to 10° warmer over northern and eastern Europe than in 1877, but closely compares with 1878; over western Europe there is a decided fall, as compared with either year, the decline extending southward into Algeria. Over British India there is a fall in pressure, as compared with either year, of from 0.05 to 0.20 inch, being most marked over the northern Provinces. The temperature, as compared with either year, is generally higher in the central and northern Provinces; elsewhere lower. Compared with the mean of the past two years, the following deviations in temperature and barometer are reported from isolated stations: York Factory, +0°.1 and +0.03 inch; Fort St. Michaels, —3°.8 and +0.23 inch; Godthaab, —2° and —0.14 inch; Stykkisholm, +2° and —0.15 inch; Tromso, +0°.2 and —0.03 inch; Thorshavn, +0°.4 and +0.12 inch; Archangel, +3°.8 and +0.13 inch; Ekaterinburg, +5° and +0.10 inch; Barnaul, —8°.9 and —0.05 inch; Yeniseisk, —4°.9 and +0.07 inch; Nikolaievsk on the Amoor, —0°.7; Valdivostock, +0°.8 and —0.02 inch; Pekin +2°.8 and —0.07 inch; Zi-Ka-Wei, +0°.5 and —0.03 inch; Tokei, +0°.7 and —0.02 inch; Tashkend, +3°.5 and —0.17 inch; Nukuss, +4°.7 and no change; Fao, compared with 1877 only, +12° and +0.05 inch; Beirut, —0°.5 and +0.02 inch; Mauritius, —2°.6 and —0.03 inch; Fort Napier, —4° and +0.08 inch; Cape Town, +4° and +0.05 inch; Free Town, —1°.5 and —0.01 inch; Paramaribo, no change and —0.03 inch; Funchal, —0°.2 and —0.05 inch; Ponta Delgado, no change and +0.22 inch; Angra, +0°.1 and —0.26 inch; Bridgetown, +2°.6 and —0.10 inch; Navassa, —1°.6; Medellin, —0°.7; San José de Costa Rica, —3°.1; Mexico, —4° and —0.01 inch; Melbourne, —0°.5 and —0.07 inch; Hobart Town, —10° and +0.08 inch.

Chart No. VI.—This chart displays the tracings of the probable courses of sixteen of the principal storm areas of the Northern Hemisphere for the month of August, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways, from the logs of vessels of the merchant marine of the North Atlantic Ocean. Unusual interest attaches to the low areas of this month, owing to the peculiar course of No. I, but more particularly to the evidences of cyclonic disturbance, as indicated in the characteristic courses of Nos. X and XIII. Concerning the general distribution of storm paths, the following is given: Six storms were confined to the territory of the United States and Canada and the neighboring waters, as included within the meridians of 60° and 100° W. and the parallels of 15° and 50° N. Two originated over the United States, but passed over the ocean to near the mainland of Europe. Two first appeared over the ocean between Greenland and northwestern Europe, passing thence northeastward and disappearing north of Russia. Three formed over the ocean southwest of the British Isles, two of which, after crossing them, passed eastward over central Europe, while the other passed northeastward north of Scotland, and after crossing northern Scandinavia, disappeared over northern Russia. Two formed over southern Russia, taking thereafter an easterly course, and one passed northeastward from the Japan Sea to the Aleutian Islands. Of the storms over North America, No. I appeared in Manitoba on the 1st, the area of low pressure extending southward into Kansas, with southerly winds thence northward; Fort Garry, 29.76, SE.; Pembina, 29.70, S. During the 2d and 3d, passed eastward over the Provinces of Ontario and Quebec attended by light rains and moderate changes in pressure. Morning of the 4th, central over the Gulf of Saint Lawrence, with light to brisk winds and occasional rains. 5th, remained about stationary, with slowly rising pressure, developing on the 6th into a very marked depression, the barometer having fallen in the past twenty-four hours from 0.15 to 0.25 inch. 7th, central off the southwestern coast of Newfoundland; Sydney, C. B., 29.31, SW.; Charlottetown, P. E. I., 29.48, NNW.; Saint John's, Newfoundland, 29.74, SE. 8th, central over the ocean to the southeast of Newfoundland; in 45° 30′ N., 50° 40′ W., 29.61; at Saint John's the barometer rose to 30.12, wind SW. 9th, passed northeastward to near 50° N., 35° W.; in 47° 35′ N., 33° 30′ W., 29.57, NW. fair; in 49° N., 30° W., 29.48, SW. fair; in 44° 34′ N., 52° 21′ W. steamship Westphalia encountered violent NNW. storm, high seas; in 48° N., 24° W., 29.74 S., force 7, light rain. 10th, in 49° 30′ N., 28° 35′ W., 29.43, N. fair; in 48° 45′

Table of comparative maximum temperatures for the month of July—Continued.

State or Territory.	Maximum for July, 1881, Signal Service.		Highest since Signal Service stations were opened—3 to 10 years.			Highest from any other source.			
	Station.	Temp.	Station.	Year.	Temp.	Place.	Year.	Temp.	Length of record.
		°			°			°	*Years.*
Missouri	Saint Louis	104	Saint Louis	'74,'79	100	Allenton	1868	109	4
						Jefferson Barracks	1860	103	36
Montana	Fort Keogh	109	Fort Benton	1874	100	Fort Shaw	1872	112	13
			Fort Keogh	1879	100				
Nebraska	North Platte	104	North Platte	1877	107	Fort McPherson	1870	115	15
						Fort Kearney	1857	102	20
Nevada	Winnemucca	97	Winnemucca	1877	104	Camp Halleck	1875	110	13
New Hampshire	Mount Washington	72	Mount Washington	1875	69	Stratford	1868	100	10
						Dunbarton	1880	100	8
						Fort Constitution	1850	96	33
New Jersey	Barnegat & Atlantic City	92	Sandy Hook	1876	100	Haddonfield	1866	102	6
						Newark	1879	99	35
New Mexico	La Mesilla	105	La Mesilla	1880	107	Fort McRae	1873	116	10
						Fort Union	1871	101	30
New York	Oswego and Rochester	96	Oswego	1878	100	Poughkeepsie	1849	105	20
						Newburgh	1849	105	40
						Moriches	1868	105	16
						Fort Columbus	1825	104	59
North Carolina	Charlotte	100	Wilmington	1879	103	Weldon	1879	107	8
						Fort Johnson	1831	102	54
Ohio	Columbus & Cincinnati	103	Cincinnati	1874	103	Marietta	1859	102	53
						College Hill	'68,'79	99	67
Oregon	Umatilla	106	Umatilla	1880	107	Fort Dalles	1853	105	16
Pennsylvania	Pittsburgh	103	Pittsburgh	'76,'78	101	Carlisle Barracks	1868	105	34
						Philadelphia	1866	101	122
Rhode Island	Newport	87	Newport	1878	92	Fort Adams	1867	102	39
South Carolina	Charleston	103	Charleston	1879	104	Charleston	1752	101	?243
Tennessee	Nashville	101	Nashville	'74,'79	101	Castalian Springs	1875	103	5
						Glenwood Cottage	1860	99	10
Texas	Eage Pass	112	Laredo	1879	110	Fort Mason	1860	114	9
						San Antonio	1871	108	34
Utah	Salt Lake City	96	Salt Lake City	1877	98	Mount Carmel	1877	112	7
						Camp Douglas	1871	103	19
Vermont	Burlington	90	Burlington	1878	96	Randolph	1868	102	4
						Lunenburg	1864	97	19
Virginia	Norfolk	102	Norfolk	1876	103	Nottoway	1876	111	2
						Fortress Monroe	1837	102	55
Washington Territory	Almota	103	Dayton	1880	102	Fort Walla Walla	1859	107	10
						Fort Townshend	1870	95	22

West Virginia	Morgantown	89	Morgantown	1874	97	Weston	1877	98	8
Wisconsin	La Crosse	93	La Crosse	1874	101	Embarrass	1866	104	17
						Fort Winnebago	1838	104	14
						Fort Howard	1823	100	30
						Fort Crawford	1829	100	25
Wyoming	Cheyenne	100	Cheyenne	1874	98	Fort Laramie	1876	107	27

The following reports are from various sources, but independent of the data obtained from Signal Service stations: Cincinnati, for the week ending July 14th, the health officer reported 549 deaths, 213 of which were caused by actual sunstroke, 150 brought on by the influence of extreme heat, and the remainder the result of various diseases. The least number of deaths by sunstroke, 20, occurred on the 7th and the greatest, 68, on the 11th. Charleston, S. C., 22d, highest temperature ever recorded in the history of the city occurred on this day, but accompanied by no sunstrokes. At Dr. Blackman's drug store the thermometer registered at 8 a. m. 90°; 10 a. m., 96°; 12, noon, 99.5°; 2 p. m., 104°; 4 p. m., 101°; 6 p. m., 97°; 8 p. m., 95°; average for the twelve hours 97.5°. At the State Quarantine office, 8 a. m., 89°; 1 p. m., 100°; 2.30 p. m., 102°; 3 p. m., 97°; average for the seven hours, 97°. On the 12th of July, 1879, the temperature at Dr. Blackman's reached a maximum of 101°, the average for the day being 95.5°. In warehouses and under tinned sheds in various portions of the city, higher temperatures were recorded. At that time the suffering from heat was very great, fifteen deaths being recorded from sunstroke. A large number of horses were stricken down in the streets, and the street railways were compelled to suspend operations during most of the day. Although the hourly record as well as the daily average temperature is higher for July, 1881, still the effect of the heat upon persons and animals appears to have been far less disastrous. A strong southwest wind was blowing nearly all day, which very probably relieved the actual heat of the body by the rapid evaporation of moisture from its surface. During the heated spell of July, 1879, there was a perfect calm for nearly two days. A careful research through all the accessible authorities on the subject of maximum temperatures in Charleston shows that for one hundred years previous to 1738 the thermometer had never reached 98°, and that for one hundred and fourteen years previous to 1752 it had never reached 101°, except in that year. From 1752 up to 1791, the highest point reached was 97°. This gives a clear record from 1638 up to 1791, showing that the highest point reached during that period was 101° in 1752. Franklin, Ohio, 11th, 108° in the shade, great suffering from the heat, but no sunstrokes. Covington, Ky., 11th, 7 fatal cases of sunstroke; 12th, 11 cases, 3 fatal. Saint Louis, 11th, 38 cases of sunstroke since the 8th, 23 of which were fatal; 12th, 21 cases, 7 fatal. Lincoln, Ill., 21st, 100° in the shade, no sunstrokes. Decatur, Iowa, 21st, 2 sunstrokes, 1 fatal. Springfield, Ill., 21st, several sunstrokes, none fatal. Louisville, Ky., 11th, 7 fatal cases of sunstroke; 12th, 2 fatal. Memphis, Tenn., 12th, 4 fatal cases of sunstroke. Pittsburgh, 12th, 7 sunstrokes, 4 fatal. Lafayette, Ind., 12th, 6 fatal cases of sunstroke; hogs and cattle dying from excessive heat. Dayton, Ohio, 11th, 100 cases of sunstroke, 30 of which were fatal; 12th, 5 fatal cases. Shelbyville, Ind., 12th, a. m., 102°; 2 p m., 106°, hottest for past thirty-six years; evening, 100°; 3 fatal sunstrokes. Kankakee, Ill., 12th, 1 fatal case of sunstroke; hottest weather for many years. Springfield, Ohio, 12th, 12 cases of sunstroke, 2 fatal. Wilmington, Ohio, 10th to 12th, temperature remained steady from 99° to 101°; hottest in past forty years; 2 fatal cases of sunstroke. Portsmouth, Ohio, 12th, 104° to 108°; 5 cases of sunstroke, 1 fatal. Lima, Ohio, 12th, 8 cases of sunstroke, none fatal. Piqua, Ohio, 12th, 100° in the shade; 3 cases of sunstroke, 1 fatal. Logan, Ohio, 12th, 103° in the shade; 5 cases of sunstroke, 2 fatal. Zanesville, Ohio, 11th, 6 cases of sunstroke, none fatal; 12th, 5 cases, none fatal. Fort Wayne, Ind., 12th, 2 cases of sunstroke, 1 fatal. Rising Sun, Ind., 12th, 102° in the shade; 2 cases of sunstroke, none fatal. Waynesville, Ohio, 12th, 1 fatal sunstroke. Paris, Ky., 12th, 1 fatal sunstroke. Keokuk, Iowa, 12th, 100° in the shade; 1 fatal sunstroke. Madison, Ohio, 12th, 1 fatal sunstroke. Somerset, Ohio, 12th, 6 cases of sunstroke, none fatal. Vincennes, Ind., 12th, 1 fatal sunstroke. Circleville, Ohio, 12th, 7 cases of sunstroke, none fatal. Gore, Ohio, 12th, 106° in the shade, hottest ever known; all business suspended. New Albany, Ind., 12th, 102° to 104° from 11 a. m. to 4 p. m.; 6 cases of sunstroke, 3 fatal. Burlington, Iowa, 12th, 100° in the shade. Muncie, Ind., 11th, 100° to 103° in the shade; 6 cases of sunstroke, 1 fatal. Thornton, Ind., 11th, 104° in the shade, highest ever known; no sunstrokes. Charleston, Ind., 11th, 103° in the shade; 2 cases of sunstroke, 1 fatal. Connersville, Ind., 11th, 104° in the shade; 2 cases of sunstroke. Alton, Ill., 11th, 1 fatal sunstroke. Sidney, Ohio, 11th, 103° in the shade; 1 fatal sunstroke. Madison, Ind., 11th, 1 fatal sunstroke. Columbus, Ind., 11th, 1 fatal sunstroke. Clinton Ill., 12th, maximum temperature for past ten days 102° to 108°; hottest ever known, all business suspended; no sunstrokes. Danville, Ill., 102° in the shade; 4 cases of sunstroke, all laborers suspended work; warmest in fifteen years. New Castle, Ind., 12th, 1 fatal sunstroke. Blufton, Ind., 12th, 104° in the shade; 10 cases of sunstroke, none fatal. Knightstown, Ind., 12th, 2 cases of sunstroke, none fatal. Peru, Ind., 12th, hottest for many years, no sunstrokes. Tuscola, Ind., 12th, 100° to 105° in the shade, several cases of sunstroke, none fatal. Indianapolis, 9th, 3 cases of sunstroke, 2 fatal; 10th, 104°, 8 cases of sunstroke, 3 fatal; 11th, 100° at 4 p. m., 8 cases of sunstroke, 4 fatal; 12th, 99°, 7 cases of sunstroke, 2 fatal. Southport, Ind., 12th, 1 fatal sunstroke. Wheeling, W. Va., 12th, 1 fatal sunstroke. Chicago, 8th, 12 sunstrokes, 4 fatal. Assumption, Ill., 8th, 1 fatal sunstroke. Paxton, Ill., 8th, 1 fatal sunstroke.

Frost.—Campo, Cal., 1st, light; Crows Nest, Mont., 17th, light, 18th, heavy; Fall River, Mass., 5th, heavy; Carson City, Nev., 3d, light; Coalville, Utah, 8th.

PRECIPITATION.

The general distribution of rainfall for July, 1881, is shown on Chart No. III, from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records (covering a period of many years) of Signal Service stations, and also a comparison of the present month with such averages. Upon examination of the chart and a comparison with the records of July for previous years, it is found that there is a general deficiency over the country east of the 100th meridian, being most marked in Tennesce and the Ohio Valley. Within this large area of unusual deficiency for the month, there is a small area of remarkable excess, 4.69 inches, covering the Upper Mississippi Valley; there are small excesses in the South Atlantic States and in the Upper Lake and Northern Pacific Coast regions. Although no precipitation was reported during the month throughout California west of the Sierra Nevadas, the condition is normal. Over the Plateau regions and at the Rocky Mountain stations the usual irregularity of distribution prevails. In southeastern Arizona and southern New Mexico an unusually heavy precipitation was recorded for the month.

Deviations from the average precipitation for several years.—Illinois: Anna, this July is the only month during the past eighteen years that has no record of rainfall. Maine: Gardiner, monthly rainfall 0.38 inch above the mean for past forty-five years. Missouri: Saint Louis, Missouri Weather Service reports: monthly rainfall, 1.70 inches below the normal. New York: North Volney, monthly rainfall, 1.18 inches below the mean for the past thirteen years.

Special heavy rains.—1st, Wilmington, N. C., 4.48 inches; Smithville, N. C., 2.85; Ellsworth, N.C., 2.25, in 1 hour and 15 minutes. 3d, New Orleans, La., 3.11 in 1 hour and 15 minutes. 4th, San Gorgonio, Cal., 0.94, in one hour and 30 minutes. 6th, Elmira, Ill., 1.23, in 39 minutes. 6th and 7th, Ames, Iowa, 4.70. Dubuque, Iowa, 2.17, in 2 hours. 9th, El Paso, Tex., 6.50 in 2 hours. 9th and 10th, De Soto, Nebr., 2.80. 10th, Dubuque, Iowa, 3.32; Logan, Iowa, 3.00; Ames, Iowa, 4.55; Clear Creek, Nebr., 125, in 25 minutes. 11th, Ames, Iowa, 5.35; Port Jervis, N. Y., 1.62, in 1 hour and 30 minutes; Ellsworth, N. C., 2.00, in 1 hour; Paterson, N. J., 0.50, in 4 minutes. 12th, Fort Scott, Kans., 3.80; Flemington, W. Va., 2.00 in 2 hours; Detroit, Mich., 2.23, in 1 hour. 13th, Carroll, Ohio, 12.00, in 3 hours, (estimated). 14th, College Hill, Ohio, 2.50 in 4 hours. 19th, Port Eads, La., 2.96; Omaha, Nebr., 1.00 in 20 minutes. 20th, Mallory Lake, Hillsdale County, Mich., 0.90 in 10 minutes; Niles, Michigan, 3.08, Augusta, Ga., 1.28, in 1 hour and 5 minutes. 20th and 21st, Coldwater, Mich., 3.90. 21st, Madison, Wis., 4.32; Riley, Ill., 2.03, in 45 minutes; La Crosse, Wis., 5.00; Cresco, Iowa, 2.18, in 1 hour; Langanore Mills, Vernon County, Wis., 7.00, in 14 hours. 21st and 22nd, North Lewisburg, Ohio, 4.50; Niles, Mich., 3.60 in 10 hours; Fort Supply, Ind. T., 5.10. 22d, Columbus, Ohio, 2.24, in 9 hours; Ellsworth, N. C., 1.25 in 2 hours and 30 minutes; Helvetia, W. Va., 2.91, in 10 hours; Memphis, Tenn., 0.81, in 20 minutes; Silver City, N. Mex., 2.03 in 1 hour. 24th, Guttenberg, Iowa, 0.63 in 30 minutes; La Crosse, Wis., 0.75 in 8 minutes. 25th, Antrim, N. H., 4.33; Ashland, N. H., 3.60; Belmont, N. H., 3.08; Rowe, Mass., 3.00 in 12 hours; Auburn, Ala., 1.05 in 30 minutes. 25th and 26th, Grafton, N. H., 3.40; Lake Village, N. H., 2.89; Weir's Bridge, N. H., 3.74; Bristol, N. H., 4.29; Wolfboro', N. H., 3.00; Williamstown, Mass., 3.75. 26th, Tucson, Ariz., 3.00 in 6 hours and 44 minutes. 27th, Wilmington, N. C., 2.97; Smithville, N. C., 2.81; New Orleans, La., 1.13, in 42 minutes. 28th, Fort Barrancas, Fla., 1.17, in 30 minutes. 30th, Denver, Colo., 1.10, in 20 minutes. 31st, Atco, N. J., 3.00, in 5 hours; Dyberry, Pa., 1.00 in 15 minutes.

Largest monthly rainfalls.—Ames, Iowa, 16.31 inches; Wilmington, N. C., 12.40; Cedar Key, 11.86; Smithville, N. C., 10.65; Dubuque, 10.53; Port Eads, 10.44; Mount Washington, 9.93; Macon, N. C., 9.70; Silver City, N. Mex., 9.62; Logan, Ind., 9.50; Helvetia, W. Va., 9.48; Madison, 9.47; Fort Supply, Ind. T., 9.34; La Crosse, 8.86; Cape Henry, 8.57; Niles, Mich., 8.48; El Paso, 8.17; Auburn, N. H., 7.92; Rockford, Ill., 7.72; Flemington, W. Va., 7.60; Cresco, Iowa, 7.59; Ellsworth, N. C., 7.37; Hudson, Mich., 7.14; Independence, Iowa, 7.10; Johnsontown, Va., 7.00; New Orleans, 6.97; Coldwater, Mich., 6.75; Clear Creek, Nebr., 6.58; Pike's Peak, 6.55; Norfolk, 6.47; Saint Augustine, Fla., 6.38; De Soto, Nebr., 6.35; Portsmouth, N. C., 6.33; Antrim, N. H., 6.23; Fort Barrancas, Fla., 6.21; Beloit, Wis., 6.20; Hatteras, N. C., 6.16.

Smallest monthly rainfalls.—In California, throughout the San Joaquin and Sacramento

Valleys and westward to the ocean, the precipitation varied from 0.00 to 0.03 inch; south of Tulare Lake, along the line of the Southern Pacific Railroad to the 115th meridian, no rain fell during the month, although no less than eighteen stations reported regular observations. Over the Sierra Nevada Mountains, along line of the Central Pacific Railroad, east of the Sacramento to the Nevada State line, eight stations reported, at only one of which rain fell, viz, Truckee, 0.18 inch. Elsewhere, the smallest rainfalls are reported as follows: Elko, Nev., 0.01 inch; Corinne, Utah, and Ashwood Tenn., 0.02; Texas Hill, Ariz., 0.03; Fort Concho, Tex., 0.04; Beowawee, Nev., 0.05; Reno, Nev., Fort Totten, Dak., and Saint Meinrad, Ind., 0.10; New Harmony, Ind., 0.11; Laredo, Jacksborough, and Clarksville, Tex., 0.12; Boisé City, 0.13; Cairo, Ill, 0.18; Yuma, Ariz., and Hot Springs, Nev., 0.20; Austin, Tenn., 0.20; Salt Lake City, Utah, and Smithville, Dak., 0.21; Pioche, Nev., and Terry's Landing, Mont., 0.23; Terrace, Nev., 0.29; Port Angles, Wash., 0.30; Point Pleasant, La., 0.31; Carson City and Otego, Nev., 0.34; Fort Scott, Kans., and Madison Barracks, N. Y., 0.38; Fort Keogh, Mont., 0.39; Fort Pembina, Dak., and Fort Douglas, Utah, 0.40; McPherson Barracks, La., 0.43; Greensboro', N. C., 0.45; Thornville, Mich., 0.47; and Saint Vincent, Minn., 0.48.

Rainy days.—The number varied in New England from 8 to 21; Middle Atlantic States, 7 to 15; South Atlantic States, 6 to 17; East Gulf States, 6 to 17; West Gulf States, 4 to 14; Ohio Valley and Tennessee, 5 to 17; Lower Lake region, 8 to 12; Upper Lake region, 5 to 12; Upper Mississippi Valley, 1 to 12; Missouri Valley, 5 to 11; Red River of the North Valley, 6 to 11; Texas, 1 to 12; Rocky Mountains, 5 to 16; Middle Plateau, 0 to 10; Southern Plateau, 2 to 20; California, 0 to 4; North Pacific coast region, 8 to 13.

Cloudy days.—The number varied in New England from 3 to 11; Middle Atlantic States, 3 to 10; South Atlantic States, 2 to 12; East Gulf States, 1 to 7; West Gulf States, 1 to 7; Ohio Valley and Tennessee, 0 to 4; Lower Lake region, 2 to 5; Upper Lake region, 2 to 7; Upper Mississippi Valley, 0 to 7; Missouri Valley, 1 to 8; Red River of the North Valley 3 to 7; Texas, 0 to 6; Rocky Mountains, 2 to 10; Middle Plateau, 0 to 7; Southern Plateau, 0 to 12; California, 0 to 6; North Pacific Coast region, 6 to 11.

Snow.—Missoula, Mont., 31st, snow was clearly seen on several of the highest peaks in the main range of Bitter Root Mountains, among the most prominent being Lo Lo. Dayton, Wash., 6th, light snow fell on mountains ten miles to the southeast.

Rain from a cloudless sky.—Wooster, Ohio, 30th, at 9 p. m.

Hail storms were of frequent occurrence in the various districts, the most destructive being reported as follows: Lawrence, Mass., 4th, 2.40 p. m., most violent ever known here; for about ten minutes hail-stones fell the size of English walnuts; damage to private residences, mills, green-houses, and work-shops is estimated at thousands of dollars; fruit trees terribly injured. South Framingham, Mass., 4th, heaviest for many years; great damage to crops and window-glass; one florist lost 800 panes from his green-house. Tewksbury, Mass., 4th, very destructive; crops and fruit trees badly damaged; in one hot-house 3,000 panes of glass broken; windows at the State Asylum damaged to the amount of several hundred dollars. Lynn, Mass., 4th, 12.40 p. m., hail-stones, size of cherries, largest ever seen here before; much damage to vegetable and farm crops. Flemington, W. Va., 16th, three miles north of station a strip of ground half a mile wide and six miles long, was badly damaged by hail, which lay in heaps upon the earth; fruit-trees stripped of foliage, tobacco and corn destroyed, and other crops more or less damaged. Brockton, Mass., 21st, hail-stones varied from half an inch to one and a half inches in diameter; damage to window-glass very severe; all the large factories suffered heavy loss; reports from surrounding agricultural towns indicate an immense amount of damage. Phillips, Me., 21st, hail-stones of all sizes and shapes, square, long, round, and varying in size from walnuts to near a man's fist; great damage to crops and buildings. Abington, Mass., 21st, hail-stones size of large hickory nuts; considerable damage to crops. Winona, Wis., hail-stones size of hen's eggs, trees stripped of foliage, and large quantities of window-glass broken. Cumberland County, Me., 26th, 5.30 p. m., passed from SW. to NE., through the townships of Falmouth, Cumberland, and Yarmouth, for a distance of about 20 miles; width of path from one and a half to two miles. The central part of the storm belt was the most destructive, and within the limit of a quarter of a mile every crop was literally cut to pieces. Whole fields of grass were buried beneath the tremendous fall of hail, orchards were completely stripped of foliage and small limbs, and in some instances, trees eighteen inches in diameter were broken off "like pipe stems." Every house in the line of the storm had its windows completely riddled. The hail-stones varied in size from large marbles to hen's eggs, and fell in such quantities that at some points of the storm path, on the following morning, they were gathered to the depth of two feet, and again, even as late as noon, some portions of the wagon roads were covered with a "perfect bedding of hail-stones." The loss to the farming community is estimated at $30,000. No such storm has ever visited this section since 1833, when the hail was about as large, and the path identical. Hadley, Me., 21st., most violent and destructive storm within the memory of the oldest inhabitant; all glass on the north sides of buildings, where not protected, was broken; tobacco and corn crops a total loss; trees were stripped of their foliage, and, in some instances, those having a diameter of about one foot were twisted or broken off; dead birds were found under almost every tree. Sparta, Ky., 21st, hailstones size of hen's eggs, causing great damage to fruit and corn. Saint John, N. B., 21st, great damage to crops in parts of Kent County, particularly in the parishes of Richibucto and Welford. Hadlyme, Conn., 21st, most violent since June 28th, 1838, when half the windows in the town were destroyed, and much other damage done. Hailstones size of large walnuts; the damage to farming industries will reach many thousand dollars.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 68 to 90; Middle Atlantic States, 56 to 81; South Atlantic States, 53 to 82; East Gulf States, 68 to 76; West Gulf States, 56 to 77; Ohio Valley and Tennessee, 58 to 76; Lower Lake region, 64 to 72; Upper Lake region, 63 to 74; Upper Mississippi Valley, 61 to 75; Missouri Valley, 64 to 74; Red River of the North Valley, 59 to 73; Texas, 52 to 62; Middle Plateau, 30 to 42; Southern Plateau, 43 to 61; California, 33 to 77; Oregon, 46 to 64; Washington Territory (Olympia), 71. High stations report the following percentages not corrected for altitudes: Pike's Peak, 69.0; Santa Fé, 55.0; Cheyenne, 55.8; Denver, 47.6; Mount Washington, 81.8.

WINDS.

The prevailing winds during the month of July, 1881, at Signal Service stations, are shown on Chart No. II by arrows, which fly with the wind. Between the 82d and 92d meridians, westerly. Along the South Atlantic coast, southeast, and on the Middle Atlantic and New England coasts, southwest to northwest. In the Western Gulf States and Missouri Valley. east and south. Over Texas and the eastern Rocky Mountain slope, south and southeast. In the Plateau regions, southerly, and along the Pacific coast, westerly.

Total movements of the air.—The following are the largest total movements at the Signal Service stations: Mount Washington, 14,442; North Platte, 11,319; Hatteras, 10,543; Portsmouth, N. C., 10,175; Moorhead, 9,657; Chincoteague, 9,434; San Francisco, 9,384; Kitty Hawk, 9,082; Fort Sill, 8,904. The smallest are: La Mesilla, 1,406; Silver City, 1,910; Phœnix, 1,989; Memphis, 2,063; Florence, 2,351; Lynchburg, 2,526; Uvalde, 2,596; Springfield, Mass., 2,641; Roseburg, 2,688; Lewiston, 2,709; Nashville, 2,721; Augusta, 2,728; Fredericksburg, 2,837; San Antonio, 2,850; Morgantown, 2,855; Tucson, 2,861.

High winds.—Winds of 50 miles per hour and over were reported as follows: On summit of Mount Washington, 13th, 14th, 16th; maximum velocity, 60 miles, NW., 13th. On summit of Pike's Peak no high winds were reported during the month, the maximum, 40, SW., occurred on the 10th; Sandusky, 56, NW., 12th; Cape May, 60, SW., 14th; Kittyhawk, 60, N., 7th.

Local storms.—Few storms of this character have occurred during the month, at least those particularly destructive. and, except the violent tornado at New Ulm, Minn., none accompanied with any unusual demonstration of force or attended with great loss of life and property have been reported.

On the afternoon of the 15th the terrible tornado which visited portions of southern Minnesota appeared first as a violent northwest storm over the western portion of the State and eastern Dakota, in the vicinity of Big Stone and Traverse Lakes. With increasing energy the storm traveled southeasterly down the valley of the Minnesota River, desolating portions of the following counties: Big Stone, Lac Qui Parle, Swift, Chippewa, Renville, Sibley, Brown, Nicollete, and Blue Earth. The general atmospheric conditions preceding and accompanying the formation of this storm are given as follows: Since the 10th there had prevailed, with remarkable persistence, an area of comparatively low pressure over the western portions of Iowa and Minnesota, and the eastern portions of Nebraska and Dakota. There was considerable variability in the barometric readings within the area of low during this period, ranging, as they did, from 29.65 to 29.96. At midnight of the 10th the winds throughout the four States above mentioned were from N. to E.,.with temperatures ranging from 57° to 74°. On the following morning, with the advent from Saskatchewan Valley of an area of low pressure, the barometer fell from 0.03 to 0.18 inch below the normal, followed over Iowa and Nebraska by a veering of winds to the SE., occasional light rains, and slowly rising temperature. Eliminating the element of diurnal change, there was noted the steady advance northward of a high thermal belt, coupled with the significant constancy of southerly winds south of parallel

45° and of W. to NW. winds to the northward as far as Manitoba. These conditions continuing unabated, there appeared on the afternoon of the 15th a belt of high temperatures, ranging from 90° to 100°, extending from eastern Iowa westward to eastern Wyoming and Colorado. Over northern Minnesota and Dakota the temperature ranged from 70° to 85° with W. to NW. winds, presenting in the extreme a thermal range of 30° between the opposing northerly and southerly movements of the atmosphere. Here was abundant evidence of a very powerful concomitant in the event of sudden and violent displacements of atmospheric equilibrium. Throughout Western Dakota on the 15th thunder-storms occurred at various points and with considerable severity. Returning to the supposed region of commencement, we find the first evidence of destructive force manifested at the town of Odessa, on the Hastings and Dakota Railroad, where four buildings were demolished. Passing thence southeastward the storm swept the sparsely settled country for a width of from one to two miles, destroying farm-houses, barns, farm machinery, and killing horses, hogs, and cattle. At the town of Fairfield, Mayer township, Swift County, nearly every building was blown to pieces, four persons killed, and fifteen wounded. Outside of the town farm-houses in the track of the storm were destroyed to the number of nine; their contents and the broken timbers were scattered over the ground for hundreds of yards. The bridge over the Pomme de Terre River was lifted from its foundation, turned over, and carried four rods down the river. At Bird Island, Renville County, several houses were blown down and others unroofed, but no lives lost; the most violent portion of the storm lay farther to the southwest. At Cairo the storm was more violent; one building was lifted bodily into the air and blown to pieces; great damage was done to other buildings; five persons badly injured. In the town of Wellington three persons were killed and several wounded; six buildings destroyed; hogs, horses, and cattle killed, several animals having pieces of timber driven through their bodies by the force of the wind; one piece of scantling was found driven into the ground a distance of four feet. At West Newton five persons were killed and twelve wounded; fifteen buildings were either demolished or unroofed; a piece of forty acres of timber was nearly leveled with the ground; hardly a single tree was to be found in an upright position. At Severance, in the southwest part of Sibley County, the destruction in town and surrounding country was very great. At Milford, in the northwestern portion of Brown County, twelve or fifteen buildings were destroyed and six persons badly injured. We now reach the town of New Ulm, where the storm culminated its energy and the violence of its destructive power. The day had been exceedingly oppressive, with a gentle southeasterly breeze, and at 3.30 p. m. a heavy thunderstorm appeared in the northwest, followed in about twenty minutes by the sudden rising in the southwest of a dark and portentous cloud. These two clouds advanced toward each other, their line of march intersecting at what appeared to be a point about three miles west of the town. Before the meeting the first strong wind came from the northeast, which continued about ten minutes, during which it rained considerably. At the meeting there appeared to be a terrific contest as to which cloud should have the right of way, and when this seemed to be fully decided the clouds apparently came to the ground, the lower portion having a tendency to elongate and form a spout-like protuberance. Shortly after this action there appeared to persons observing the phenomenon at some distance from the storm center the formation of four large spouts running downward to the earth. Sometimes they touched it and again would be drawn suddenly upward to the sky. These spouts were reported as of various shapes; one in the form of an immense inverted cone; another cylindrical; a third like a huge gourd, and another oblong, with convoluted edges. They moved along with a swiftly revolving motion from right to left, and their path of destruction was about a mile and a half wide. At 4.45 p. m. (some give it 4.40 and 4.48 p. m.) the tornado entered the town, where it remained but ten or twelve minutes, during which time 47 buildings were blown to atoms and about 200 either unroofed or otherwise demolished; 6 persons were killed, 53 wounded, and 102 families rendered homeless. The loss to property in the town alone is variously estimated at from $300,000 to $500,000. The general direction of the *débris* as carried by the wind, particularly in the case of trees, appeared to be to the northeast and northwest, although there were many instances where they pointed to the south and southeast. The boundary lines of destruction were very closely defined; small frame buildings standing near solid brick structures were unharmed, while the latter were leveled to the ground. Several persons variously estimated the velocity of the wind at from ninety to one hundred and fifteen miles per hour. As the storm left New Ulm and passed to the southeastward it visited the country in the vicinity of Butternut Valley and Cottonwood Creek, where several buildings were unroofed and considerable stock killed. At 6 p. m. the storm passed over Blue Earth County, about eight miles north of Winnebago City, and disappeared at a point about two miles to the northeastward. For a distance of about ten miles the destruction to crops and buildings and the loss of stock was very severe, but the storm's path had narrowed considerably at this portion of its course, being now from a quarter to a half mile in width, with considerably diminished energy.

Boys Lake, Redwood County, Minn., 16th, a small tornado, with funnel-shaped cloud, destroyed a farm-house, stable, and small outbuildings, leaving hardly a vestige of them near their foundations. A small pond in the track of the cloud was sucked dry, the water being carried over the adjoining fields, together with a large quantity of soft mud, which was scattered over the ground for half a mile around.

Mulligan, Cottonwood County, Minn., 16th, during the afternoon a violent wind-storm passed over this section, destroying nearly every movable object in its course; several buildings were blown to pieces and others unroofed; the damage to crops was very severe. Further eastward the storm was reported as exceedingly violent.

Mallory Lake, Hillsdale County, Michigan, 12th, 3.30 p. m., two and a half miles southeast of station, violent southwest storm, unroofing and destroying buildings, leveling fields of oats and corn, demolishing fences and uprooting forest and fruit trees; occasional gaps intervened where the force of the wind seemed to raise for a short distance above the earth, and then return to it with renewed destructive energy. At Dover, fences were blown down, wheat shocks scattered over the fields and oats and corn badly damaged. Near Osseo several farm buildings were blown down, fences demolished, and trees uprooted; in Wheatland and Palmyra townships much damage to crops.

Brooklyn, N. Y., 13th, 4 to 4.25 p. m., trees, chimneys, and small outbuildings blown down, and in several cases large buildings unroofed; in northern New Jersey and on Staten Island the violence of the wind was very marked; trees were uprooted and many buildings blown down or unroofed.

Cornish, Me., 16th, 4.30 p. m., violent wind-storm or whirlwind, passing from SW. to NE., moved over the adjoining country; width of path about fifty rods and length about five miles. One large building, 70 by 15 feet, directly in the path of the storm cloud, was blown to pieces, carrying the *débris* several hundred yards; many other buildings were more or less damaged, and orchards suffered severely; in passing over a cemetery which chanced to be in the storm's path three large stones, twenty inches in diameter and several feet in height were broken off by the violence of the wind. Some hail accompanied the storm, but did no damage. The storm cloud, after crossing the Ossipee River, appeared to rise from the earth, when further evidence of its existence vanished.

Fostoria, Ohio, 7th, during night, most violent wind storm for years; many buildings, among the largest in town, were unroofed and several blown down; in the country very disastrous effects were produced upon standing crops.

Off Reedy Island, near Fort Delaware, Delaware River, 7th, 7 p. m., terrific wind-storm, lasting forty minutes; storm passed from SW. to NE., and the rain fell in torrents for about ten minutes; British bark Beatrice was struck by lightning and burned to the water's edge; the captain of an ocean steamer who passed through the storm stated that it was the most terrible he had witnessed in twenty years; it was short but exceedingly furious.

Perry Valley, Iowa, 7th, violent wind-storm passed over this region, destroying several farm-houses and the highway bridge over Perry's Creek.

Rensselaer County, N. Y., 26th, violent wind-storm swept over the county in the vicinity of Troy, demolishing buildings, uprooting trees, and severely damaging crops. Fort Supply, Ind. T., 22d, 10.30 p. m., wind blew from the northwest at the rate of 30 to 60 miles per hour; but little damage was committed, owing to the sheltered position of the town.

In northern Kentucky, southern Ohio and Indiana, violent wind and rain storms, causing great damage to crops and buildings, were experienced on the 21st.

Americus, Ga., 18th, at some distance from the town a small whirlwind, about five feet in diameter and sometimes 100 feet high, formed over a corn-field, where it tore up the stalks by the roots and carried them, with sand and other loose materials, high into the air. The body of the whirling mass was of vaporous formation and perfectly black, the center apparently illuminated by fire and emitting a strange "sulphurous vapor" that could be distinguished a distance of about three hundred yards, burning and sickening all who approached close enough to breathe it. Occasionally the cloud would divide into three minor ones, and as they came together again there would be a loud crash, accompanied by cracking sounds, when the whole mass would shoot upward into the heavens.

New Jefferson, Harrison County, Ohio, 16th, one church, many barns, stables, and other buildings were blown down; about twenty horses were killed by the falling of stables; much damage to crops and fences in surrounding country.

Atlanta, Ga., 12th, 5 p. m., terrific wind-storm from the northwest, continuing thirty minutes; the heavens were of inky blackness, which, with the fury of the wind, made an appalling sight; considerable damage was done to fences, trees, and outbuildings.

Winona, Wis., 11th, 5 p. m., the car-shops of the Winona and Saint Peter Railroad, 40 by 150 feet, were completely demolished; the air was filled with boards and other *débris* during the passage of the storm; several other buildings were badly damaged.

Fort Wayne, Ind., 12th, 5 p. m., unroofing houses, destroying shade trees and fences, and severely damaging crops.

Danville, Va., 8th, 5 p. m., buildings unroofed and blown down and considerable destruction to fences, trees, and crops.

Dallas, Tex., 1st, during night, fearful storm of wind and rain, fences, outbuildings, six residences, and one church were demolished.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for July, 1881, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage to be 87.57 per cent. The percentages for the four elements are: Weather, 93.6; Direction of the Wind, 83.1; Temperature, 87.3; Barometer, 86.3. By geographical districts they are: For New England, 86.9; Middle States, 82.6; South Atlantic States, 87.9; Eastern Gulf States, 91.4; Western Gulf States, 92.2; Lower Lake region, 86.0; Upper Lake region, 86.6; Tennessee and the Ohio Valley, 90.8; Upper Missouri Valley, 86.1; Lower Missouri Valley, 84.3; Northern Pacific Coast region, 98.3; Central Pacific Coast region, 100.0; Southern Pacific Coast region, 100.0. There were 82 omissions to predict (46 being due to the absence of reports from the Pacific coast), out of 3,813, or 2.15 per cent. Of the 3,731 predictions that have been made, 84, or 2.26 per cent. are considered to have entirely failed; 140, or 3.75 per cent. were one-fourth verified; 376, or 10.07 per cent. were one-half verified; 347, or 9.30 per cent. were three-fourths verified; 2,784, or 74.62 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—Thirty-five cautionary signals were displayed during the month, of which 29, or 82.86 per cent., were fully justified by winds of twenty-five miles per hour or over, at or within a radius of one hundred miles of the station. No off-shore signals were displayed. The above does not include signals ordered at display stations where the velocity is only estimated; one hundred and three winds of twenty-five miles or over were reported, for which no signals were ordered. Six signals were ordered late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water, as observed at Signal Service river gauges during the month of July, 1881. At no time during the month were rivers above the danger line at any of the various stations. The highest water in the Red, Arkansas, and Mississippi Rivers was reached between the 3d and 4th; in the Mississippi River between the 1st and 18th; in the Ohio, Cumberland, and Tennessee Rivers between the 1st and 6th; in the Monongahela on the 23d and 24th, and in the Willamette, at Portland, Oreg., on the 1st.

Floods due to unusually heavy rains were particularly destructive to crops and other property in the northern portion of the Upper Mississippi Valley, being most severe in those portions of the States of Illinois, Iowa, Wisconsin, and Minnesota bordering on the Mississippi River. *California.*—San Gorgoino, 4th, heaviest rain-storm in seven years; mountain streams turned into rushing torrents, washing out field crops and fruit trees. *Colorado.*—Denver, 30th, very heavy rains, flooding all streams and causing damage estimated at $50,000 to streets, stores, and cellars. *Iowa.*—Carroll, Carroll County, 13th, heaviest rain-storm ever known in this State; 12 inches (estimated) fell in three hours; creeks and rivers overflowed and all bridges for miles were carried away, roads impassable, and all communication cut off. Cedar Rapids, 13th, the destruction of railroad, farm, and city property immediately west of here by heavy rains is unparalleled in the history of this region. The railroad companies were the greatest sufferers, a very large number of valuable bridges and culverts being washed out and many miles of track ruined. Marengo, 13th, river highest ever known; public square two feet under water and boats were propelled through the streets without difficulty; several large flouring and woolen mills flooded; court-house, post-office, and a large number of business houses flooded; entire damage estimated at $500,000. Waukee, 11th, heavy washout on the Des Moines and Northwestern Railroad. Leighton, 11th, between this station and Pella, track badly damaged and bridge carried away. Marshalltown, 11th, water four feet deep in the town, great damage to property. Colfax, 11th, water rose above the flat cars standing near the depot; tracks badly washed; communication cut off. Kellogg, 11th, from this town to Wilton railroad-track badly washed; farming lands submerged; Raccoon and Des Moines rivers rising rapidly, cutting the levees badly. Bentonsport, 15th, Des Moines River, 12½ feet above low-water mark, a rise of 32 inches in about twelve hours. Ottumwa, 15th, Des Moines River highest for years. Brighton, 15th, Skunk River overflowed; railroad bridge badly damaged. Des Moines, 11th, river at flood tide; several hundred yards of railroad-track washed away; 15th, water much higher, inundating the first story of the flouring mill; the brick and saw-mills completely surrounded; lower portion of city near Walnut street submerged; people deserted their homes; several narrow escapes; Raccoon River overflowed, backing up the Des Moines River, so as to submerge the western portion of city to the depth of four feet; lowlands to the southwest of city submerged, driving out the stock. Keokuk, 13th, Des Moines River very high, damaging railroad-bridge, three miles below station; 15th, river rose at the rate of 1½ inches per hour; 16th, full of heavy driftwood, track of the Keokuk and Saint Louis Railroad submerged; 18th, river stationary at 22 inches above the danger line; bottom-lands below Alexandria overflowed and trains on the Keokuk and Saint Louis Railroad stopped; 19th, river falling slowly. *Wisconsin.*—Salem, 21st, the La Crosse division of the Milwaukee and Saint Paul Railroad badly washed in many places, delaying all trains. La Crosse, 21st, immense damage in surrounding country; all rivers and creeks above their banks; in the city, basements were flooded, in many cases entailing great loss; streets were very badly washed, in some cases to the depth of 12 or 15 feet. Chaseburg, Vernon County, 21st, water four feet higher than ever known before; great amount of damage done to buildings, bridges, and crops. Coon Valley, 21st, water highest ever known, seven persons drowned; bridges all gone, roads impassable and all communication cut off. Winona Junction, 21st, 700 feet of the Chicago, Milwaukee and Saint Paul Railroad washed out; heaviest rain-storm for years. Campbell, 21st, bridges washed away; roads almost impassable. Bostick Valley, Vernon County, 21st, bridges and dams entirely gone; over 500 tons of hay carried away by the rushing torrent of water; loss to farmers exceedingly severe, in several instances reaching $1,000 to a single proprietor. In the townships of Webster, Liberty, and Kickapoo nearly every bridge was swept away; at Bloomingdale and Avalanche the bridges, although very substantial structures, could not withstand the terrible force of the flood. Reports from Springfield, Vernon County, show that the crops are completely ruined, and on the lowlands everything is several feet under water. At Kickapoo Centre and Readstown, highest water ever known; crops in a terrible condition. *Indiana.*—Fort Wayne, 21st, heaviest rain-storm for years; 35 feet of canal-bank washed out in eastern part of city, and great damage done by the overflow of water. Between this city and Aboite aqueduct, five miles west, five breaks were reported; dangerous washouts on the Fort Wayne and Jackson Railroad and on the Wabash Railroad; several new buildings in process of construction badly damaged. Goshen, 21st, all trains on the Air-Line Division of Lake Shore Railroad delayed on account of heavy washouts; heaviest rain-storm for many years. New Paris, 21st, railroad tracks washed out; much damage to farm crops. Elkhart, 21st, all streams overflowed; heavy washouts on highways and railroad-tracks. *New Mexico.*—Silver City, 22d, in consequence of heavy rains, mountain streams were greatly swollen, flooding some of the principal streets to a depth of two feet; 25th, mountain streams again overflowed; 28th, streams again overflowed, badly washing streets and destroying considerable property. *New York.*—Dresden, 21st, heavy washout on the Delaware and Hudson Railroad, one passenger train wrecked. *Illinois.*—Waukegan, 21st, severest rain storm for years; roads impassable; fields flooded. *Michigan.*—Coldwater, 21st, terrible storm of wind and rain; hundreds of acres inundated in various parts of the county; large amount of hay and wheat ruined.

Drought.—*Alabama.*—Selma, 15th, gardens and farm crops drying up. Montgomery, 15th, on several plantations in the surrounding country the entire corn crop has been cut down to save the fodder, as the protracted drought has prevented it from developing. *Arkansas.*—In the northern part of the State no rain fell during the first half of the month; early corn badly damaged, other crops not seriously. *Illinois.*—Anna, 15th, crops suffering, wells, cisterns, ponds, and creeks drying up. In the northern portion of the State, and especially in the oat section about Galena, drought has been very severe; the oat crop is a failure, and wheat will make about half a crop. Cairo, 15th, ground parched and vegetation drying up. Springfield, 15th, crops suffering. *Indiana.*—Vevay, 28th, crops and orchards suffering for want of rain; Saint Meinrad, 16th, corn crop suffering. *Indian Territory.*—Cantonment, 11th, vegetables and field crops ruined; Fort Gibson, crops suffering severely. *Georgia.*—In many localities in the interior and northern portions of the State the corn crop is entirely lost, and garden crops have suffered severely. *Kansas.*—Independence, 30th, very dry, crops suffering; Clay Centre, 28th, crops suffering. *Louisiana.*—Assumption Parish, 15th, corn and rice crops suffering severely; Calcasieu Parish, 15th, all crops suffering from want of rain; corn, cane, and cotton badly damaged; Catahoula Parish, 15th, corn and cotton suffering severely; the weather has been so hot that, to a considerable degree, regular farm labor has been suspended; East Carroll Parish, 15th, corn crop greatly injured, cotton will harvest but half a crop; Lafayette Parish, 15th, corn and potatoes badly damaged and peas will harvest but half a crop; Ouachita Parish, 15th, corn will not harvest one-fourth of the crop, and fodder is nearly all burned up; in La Fourche, Lincoln, Rapides, and Saint John Parishes, 15th, the corn crop has suffered severely and vegetables are badly damaged. *Missouri.*—The Missouri State Weather Service reports that the whole State has suffered from severe drought during the month; in the eastern and southeastern part of the State wells and creeks have dried up and vegetation has suffered severely; the ground was parched and dusty and the corn crop has been damaged to such an extent, not only in this section, but throughout the State, that hardly one-half of the usual crop will be harvested; Oregon, 30th, very dry, crops suffering. *Michigan.*—Litchfield, first part of month very dry, crops severely injured; Thornville, 15th, very dry; Port Huron, 17th, crops suffering severely. *Mississippi.*—In the central portion of the State corn and oats have suffered severely, and cotton has been more or less damaged in several counties. *North Carolina.*—Highlands, month very dry, crops suffering. *Ohio.*—Bethel, month very dry, crops suffering, fruit very poor; College Hill, month very dry, vegetation suffering; North Lewisburgh, 1st to 20th, greatest drought ever experienced in this section. *Nebraska.*—Howard, very dry, crops suffering. *Pennsylvania.*—Milton, during former part of month drought very severe, injuring crops badly. *South Carolina.*—Darlington, throughout the neighboring country crops suffered during the first half of month. Barnwell County, 30th, the winds for the past two weeks have been very hot and dry, and the corn crop is a complete failure. Clarenden County, corn will average about half a crop and cotton about three-fourths of a crop. Williams County, 30th, drought still prevailing, and is unprecedented in the annals of this county. Orangeburgh County, corn falling down in fields, compelling the farmers to harvest it as forage; driest weather for many years. Anderson County, in the southern portion, crops literally ruined, the upland corn is dead, and cotton has shed nearly all of the little fruit it had. Marion County, 30th, corn will average from one-fourth to half a crop. Sumter County, 30th, corn and cotton crops badly damaged. *Tennessee.*—Ashwood, 30th, no rain for 33 days; Nashville, 30th, most severe ever known, far more destructive than the great drought of 1854; corn crop a complete failure. In some parts of western Tennessee no rain has fallen since the last three days of June; cotton crop suffering greatly, farmers cutting down corn to save it for fodder; wells and streams dry, and people as well as animals are really suffering; in some cases people are hauling drinking water a distance of several miles; the earth is baked, and roadways are powdered to a depth of 6 inches. Chattanooga, 30th, crops suffering severely. Memphis, 30th, crops suffering severely. *Texas.*—Clarksville, 30th, crops suffering badly. In the counties of Atascosa, Arkansas, Bexar, Comanche, Fannin, Sabine, Hopkins, Henderson, and Hunt, during the first part of month, crops suffered severely. Corsicana, 30th, month very dry, vegetation badly damaged. Indianola, 7th, cisterns empty, streams very low. *Virginia.*—Wytheville, 30th, cisterns and streams drying up, crops suffering. Lynchburg, 12th, small streams completely dried up and even wells fail to meet their purpose; cattle have to be driven, in some instances, as far as six miles for water; crops suffering badly.

Waterspouts.—Somerset, Mass., 21st, 3.15 p. m., two waterspouts observed on Taunton River. Lake George, Fla., 14th, two heavy squalls from opposite directions met squarely in the lake in front of the observer's place, producing a terrible whirl, the water immediately rising from the center of the whirl, forming a long column, reaching from the clouds to the lake, and having the form of an hour-glass. It traveled some distance, and as the whirl subsided broke in two in the middle, the upper part ascending and mingling with the clouds and the lower part falling into the lake with a splash.

TEMPERATURE OF WATER.

The Temperature of Water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of Chart No. III. Daily observations for the entire month were made at all stations, except at Escanaba, where they are wanting from the 5th to the 11th, inclusive.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—In the various districts they were reported on the following dates: New England, 1st to 4th, 5th, 10th to 18th, 20th, 21st, 23d to 29th. Middle Atlantic States, 1st, 3d, 4th to 7th, 11th to 14th, 16th, 19th to 23d, 25th, 26th to 31st. South Atlantic States, 1st, 2d, 8th to 15th, 17th to 23d, 25th to 28th, 30th, 31st. Florida, 1st to 3d, 10th to 24th, 27th to 31st. Eastern Gulf States, 1st, 2d, 9th to 14th, 17th, 18th, 23d, 25th to 28th. Western Gulf States (including Texas), 1st, 2d, 3d, 4th, 6th, 9th, 10th, 12th to 18th, 21st, 22d, 24th, 25th, 29th. Ohio Valley and Tennessee, 6th to 17th, 21st, 22d, 25th, 27th to 30th. Lower Lake region, 5th, 6th, 7th, 8th, 10th, 12th, 13th, 16th, 18th, 20th, 21st, 25th, 27th, 29th to 31st. Upper Lake region, 4th to 10th, 12th, 13th, 15th, 16th, 20th to 25th. Upper Mississippi Valley, 2d, 6th to 17th, 20th, 21st, 24th. Lower Missouri Valley, 6th to 17th, 19th, 20th, 22d to 25th, 29th. Southern Slope, 1st, 2d, 8th, 10th, 11th, 14th to 17th, 19th, 24th to 31st. Middle Slope, 2d, 4th, 5th, 6th, 8th, 10th, 12th, 13th, 20th, 21st, 22d, 25th, 29th. Northern Slope, 1st, 2d, 9th, 11th, 13th, 14th, 16th to 20th, 23d, 25th, 30th. Southern Plateau, 3d to 8th, 10th, 11th, 14th, 16th to 26th, 27th, 30th. Middle Plateau, 1st, 2d, 10th, 15th to 19th, 25th, 27th. Northern Plateau, 2d, 3d, 9th, 11th, 15th, 18th, 19th, 23d, 24th, 26th to 28th. Southern Pacific Coast region, 3d, 25th. Middle Pacific Coast region, 4th. Northern Pacific Coast region, 18th, 23d, 30th, 31st.

The following items of interest connected with the peculiar manifestations of electricity during the progress of thunder-storms were obtained from various sources: La Crosse, 21st, church-spire demolished, six or seven houses badly damaged, and a number of barns burned. Oakland, Wis., 21st, several buildings struck and burned. Port Washington, Wis., 21st, three boys while crossing a bridge at a rapid gait, and elbow to elbow, were enveloped by a flash of lightning, instantly killing the two outside boys, while the middle one was left uninjured. Richmond, Va., 13th, about eight miles from town a large tree was set on fire by electricity, and a shell which was lodged in the tree during the late war was exploded thereby with a deafening report. Carr Station, Colo., 16th, a cowboy while riding his horse to seek shelter from the storm was instantly killed; his body was terribly disfigured and burned; the horse had its head split open and brains scattered about, while the remainder of the body was badly mangled; all the metallic portions of the saddle and bridle were burned off. On New York Bay, 15th, a small fishing schooner, containing two ladies and one gentleman, had its mast shattered to splinters down to the step, without doing the slightest injury to the hull of the boat or its occupants; the heads of the ladies were within one foot of the mast when struck. Grafton, Ohio, 31st, in passing through the roof of a residence near one of its chimneys the electricity entered a room below where two little girls were playing. It struck one of them on the head and passed down the right side of her face and over her breast to her knees, leaving a mark about two inches wide and completely stripping off her clothing, which was torn into shreds; the child was instantly killed, while her companion remained uninjured. Saugus, Essex County, Mass., 21st, electricity entered the telegraph office upon a wire connected with the instruments, burning off the connections and completely destroying one of the wires; a lady who sat about two feet distant from the instrument table, copying a message, had her pen and penholder melted in her hand, the paper was scorched, the carpet burned, torn up, and blackened, and the room filled with smoke; there were several sharp, cracking explosions, which were heard a considerable distance; the lady experienced no sensation, except a slight pain in her side nearest to the instruments, otherwise she was perfectly uninjured; the walls of the house were scorched and blackened along the course pursued by the electricity. Concord, N. H., 21st, the wires in the telephone exchange were completely burned out, stopping all communication with surrounding towns. Schuylkill and Columbia Counties, Pa., 29th, most violent thunderstorm for years; several persons killed by lightning and many buildings along the course of the storm badly shattered or burned. Waunakee, Wis., 20th, most violent thunderstorm for past twenty-five years; the electricity tore a hole about 6 by 4 feet in the roof of a house, and, passing thence down the chimney, demolished every wire-screen door in the building without injuring the occupants; twenty-six pigs, lying under a tree twenty-five rods from the house, were instantly killed. Fremont, Ohio, 8th, three horses instantly killed in an open, treeless field. Chicago, 20th, house struck, tearing off the shingles and siding as though so much paper; the electricity appeared to envelop the whole building, knocking the chimney into sections, cracking the stove and demolishing the windows; one person instantly killed in a group of three and the others seriously stunned. Columbus, Ohio, 22d, house struck, tearing the chimney to pieces and filling the rooms with soot; the inmates were not injured in the least. Delaware, Ohio, 22d, at a point about eight miles west of town, electricity passed down the chimney of a house, splintering several joists; then moving onward and down the sides of the building it entered the room below, tearing a bed into shreds; from here it passed to a cook-stove in an adjoining room, breaking it into innumerable pieces, and passing thence to a man who stood near, ran down his arm and leg and disappeared through the floor, in which it left a large hole. This person complained afterwards of sharp pains passing from one leg to the other, and was unable to close his hand.

Atmospheric electricity interfering with telegraphic communications.—Fort Missoula, Mont., 19th; Umatilla, Oreg., 2d, 19th, 29th; Phœnix, Ariz., 23d; Camp Grant, 21st, 23d; Fort Cummings, 11th; Concho, 1st, 11th, 15th; Fort Davis, 8th and 16th; Decatur, 11th and 26th; Jacksborough, 1st, 15th; Fort Sill, 14th, 21st, 30th; Fort McKavett, 1st, 2d, 14'h; Eagle Pass, 1st; Castroville, 2d, 16th; Uvalde, 16th, 17th; Bismarck, 18th, 19th; La Crosse, 21st; Mason, 15th, 16th; Fredericksburgh, 15th, 16th; Mount Washington, 16th, the electricity entered the printing-office at the summit, scattering a case of type; it also burnt one of the wires in the telegraph office; in the signal office it burnt the telephone wires, passed half way round the room, burning the wires in several places and scorching the woodwork.

Auroras.—The display of the 2d was the most widely observed of any reported during the month, the line of observation continuing westward from Sydney, N. S., to Bismarck, and northward from the 39th parallel to Duluth. The following stations reported, and generally between the hours of 9 p. m. and midnight: Halifax, N. S., Charlottetown, P. E. Island, Toronto, Can., Gardiner, Me., Eastport, 9.15 to 11.30 p. m.; Portland, 9 p. m. until after midnight; New Haven, 9 p. m. until after midnight; Strafford, Vt., Contoocookville, N. H., Williamstown, Mass., Cambridge, Mass., Fall River, Mass., Springfield, Mass., Newport, R. I., 10 p. m. until after midnight; Freehold, N. J., Little Egg Harbor, N. J., Ithaca, N. Y., Sandusky, Ohio, Toledo, 10 p. m. until midnight; Detroit, 10 p. m. until after midnight; Grand Haven, 9.30 p. m. until after midnight; Madison, Wis., Mission House, Wis., Clinton, Iowa, Fort Madison, Iowa, Duluth, 8.30 to 10.50 p. m.; Huron, Dak., 9.30 p. m. until after midnight; Bismarck, 10 p. m. until after midnight. The display of the 3d, a continuation, in most cases, of the 2d, was visible at scattering stations from Eastport westward to Yankton, and generally between midnight and 2 a. m.; Eastport, midnight to 2 a. m.; Newport, midnight to 1 a. m.; Grand Haven, midnight to 2 a. m.; Monticello, Iowa, midnight to 2.30 a. m.; Clear Creek, Nebr., midnight to 2 a. m.; Yankton, 8 to 9 p. m. Isolated displays were reported as follows: Westborough, Mass., 5th, 10.30 p. m.; Fall River, Mass., 6th, 15th; Newport, Vt., 29th; Madison Barracks, N. Y., 29th, 9.25 p. m.; Montreal, Can., 29th; Burlington, Vt., 22d, 10 to 11 p. m.; 23d, 9 to 11 p. m.; 29th, 10 p. m. to midnight; Toronto, Can., 27th, 29th; Halifax, N. S., 31st; Sydney, N. S., 24th, 25th; Fallsington, Pa., 21st, 31st; Vevay, Ind., 26th, 27th (29th, 9.55 p. m.); Saint Paul, Minn., 1st, 8.30 to 11 p. m.; 12th, 9 to 11.20 p. m.; 13th, 9 to 11 p. m.; Embarrass, Wis., 24th; Saint Vincent, Minn., 12th, 9.40 p. m. until midnight; Fort Stevenson, Dak., 17th.

Zodiacal light.—Nashville, Tenn., 16th, 18th, 20th to 23d, 25th, 27th to 31st; Monticello, Iowa, 19th, 25th, 30th; Cambridge, Mass., 19th; Northport, Mich., 13th.

OPTICAL PHENOMENA.

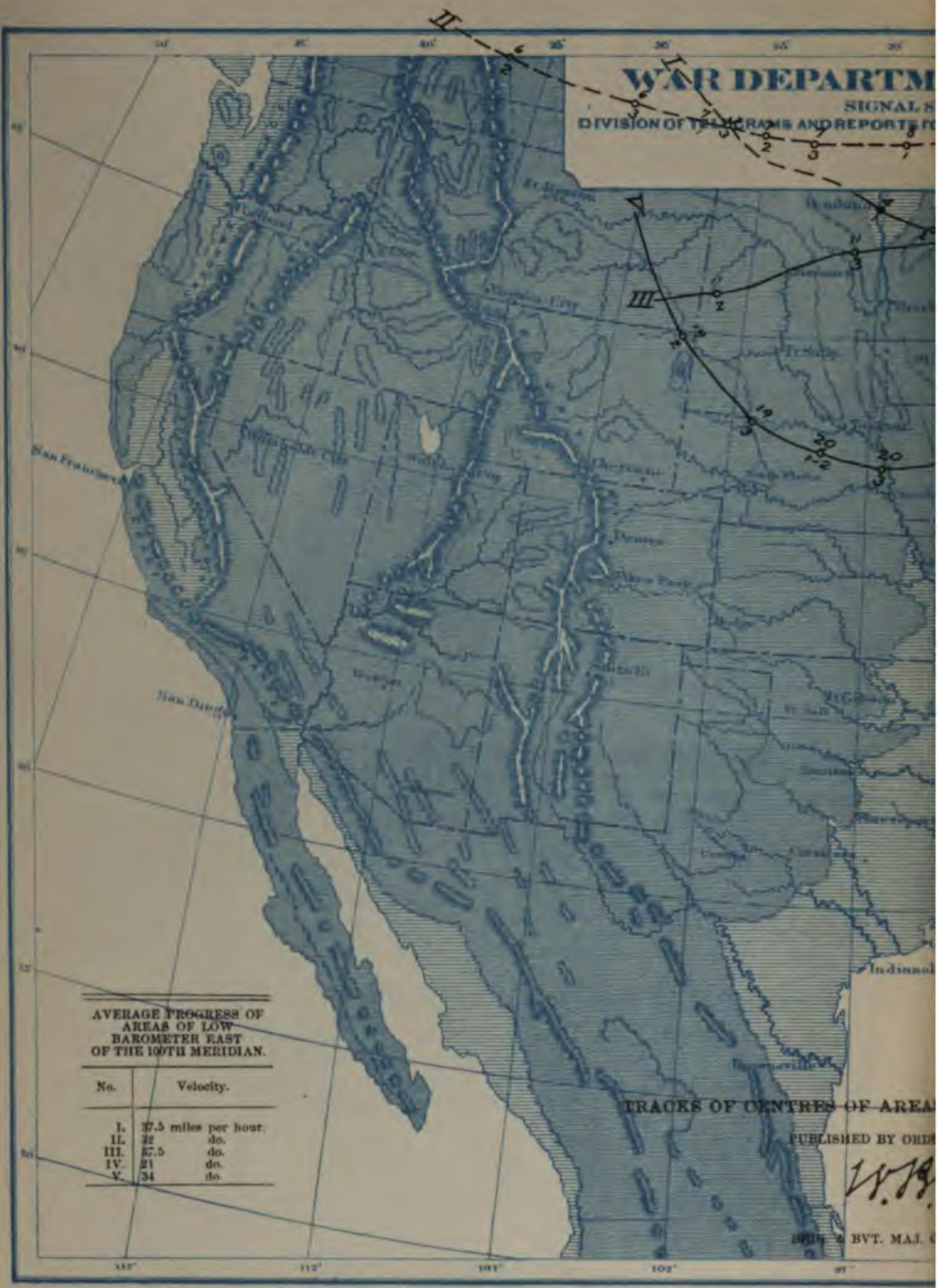
Solar halos have been observed in the various districts on the following dates: New England, 3d, 7th, 18th, 25th, 27th; Middle Atlantic States, 9th, 15th, 22d, 29th, 30th; South Atlantic States, 6th, 7th, 29th; Florida, 12th and 30th; Eastern Gulf States, 30th; Texas, 14th; Ohio Valley and Tennessee, 4th, 11th, 12th, 13th, 18th, 20th, 26th, 30th; Lower Lake region, 26th; Upper Lake region, 2d, 3d, 11th, 14th, 16th, 26th; Upper Mississippi Valley, 13th; Missouri Valley, 9th, 13th, 27th, 29th; Middle Slope, 11th, 14th; Middle Plateau, 5th, 8th, 13th; Northern Pacific coast region, 24th, 29th.

Lunar halos have been observed in the various districts on the following dates: New England, 1st, 4th, 10th; Middle Atlantic States, 4th, 5th, 7th, 9th, 11th to 15th; South Atlantic States, 4th, 7th, 10th, 11th, 13th; Eastern Gulf States, 5th, 9th, 12th; Western Gulf States and Texas, 1st, 3d to 9th, 11th, 14th, 20th; Ohio Valley and Tennessee, 11th, 13th, 14th, 15th, 16th, 19th, 24th; Lower Lake region, 7th, 10th to 13th, 15th; Upper Lake region, 12th, 14th; Upper Mississippi Valley, 2d, 6th, 9th, 11th; Missouri Valley, 1st, 9th, 14th; Southern Plateau, 7th, 8th, 31st.

MISCELLANEOUS PHENOMENA.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from the 183 stations show 5,625 observations to have been made, of which 28 were reported doubtful; of the remainder, 4,644, or 83.0 per cent., were followed by the expected weather.

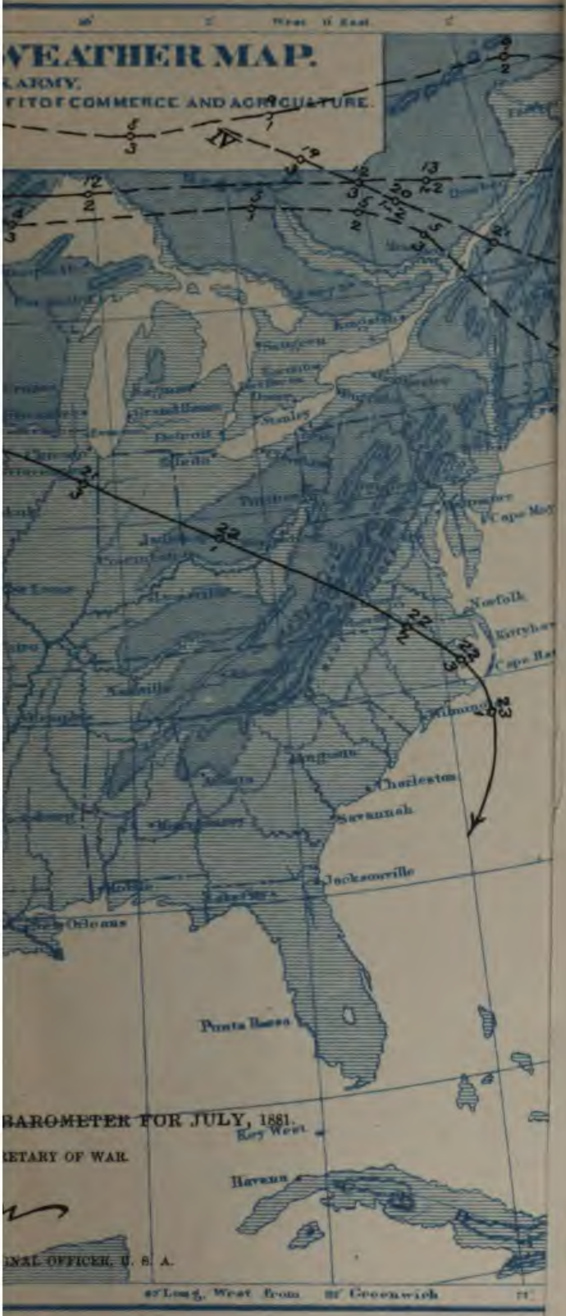
1



AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.

No.	Velocity.
I.	27.5 miles per hour.
II.	22 do.
III.	27.5 do.
IV.	21 do.
V.	34 do.

2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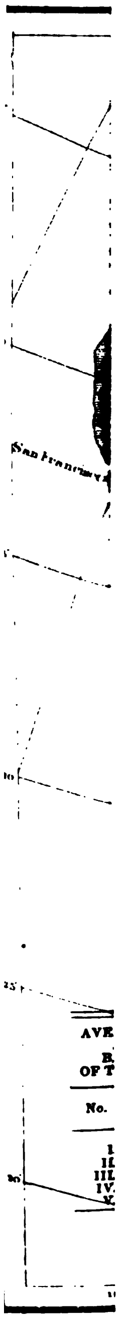
WEATHER MAP.
ARMY.
T OF COMMERCE AND AGRICULTURE.
IV
Kingston
Saugeen
Toronto
Buffalo
Stanley
Detroit
Toledo
Pittsburg
Cape May
Norfolk
Kittyhawk
Cape Hatteras
Wilmington
Augusta
Charleston
Savannah
Jacksonville
Nashville
Atlanta
Montgomery
Mobile
New Orleans
Punta Rassa
Key West
Havana
BAROMETER FOR JULY, 1881.
RETARY OF WAR.
NAL OFFICER, U. S. A.
Long. West from Greenwich


San Francisco
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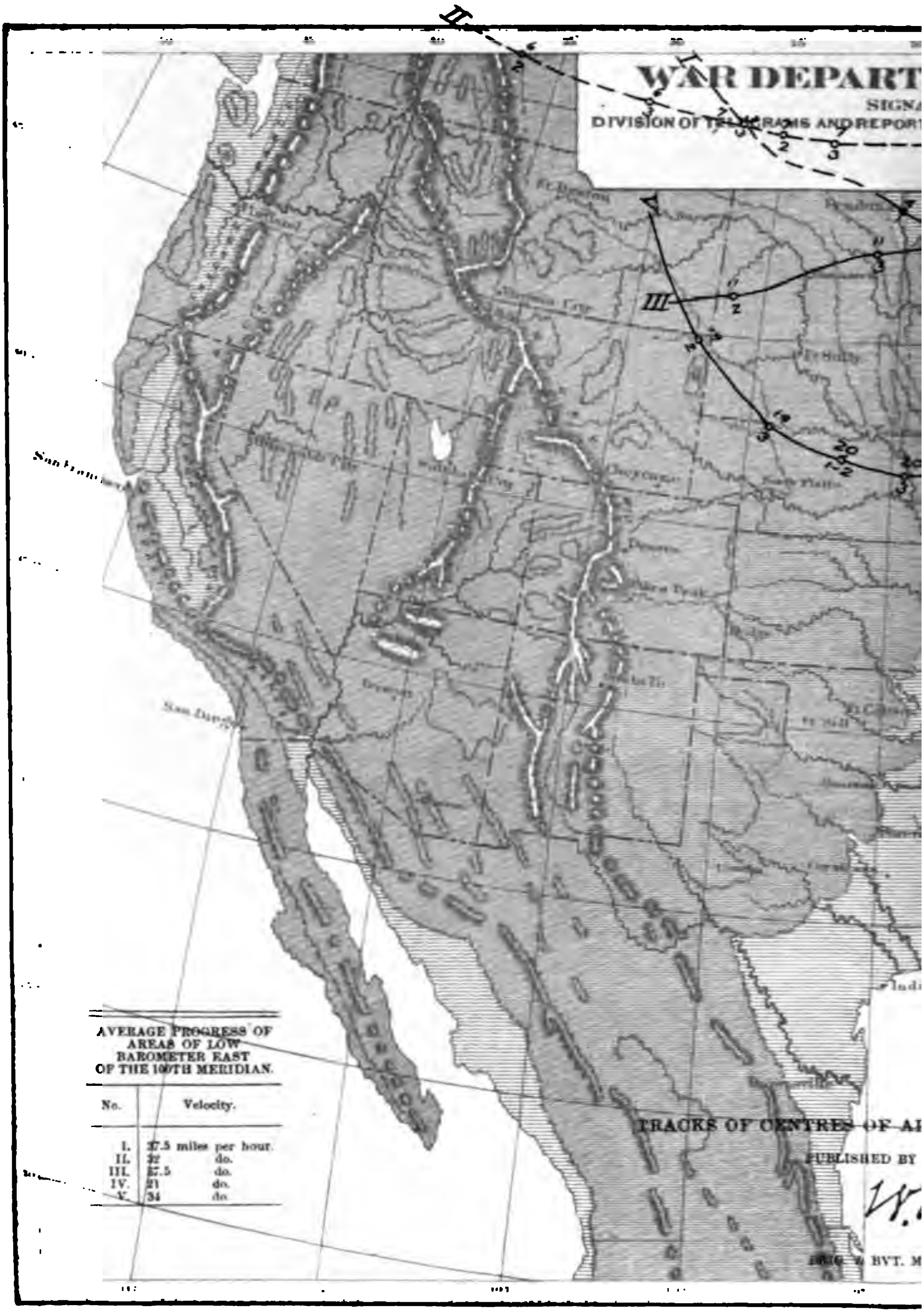
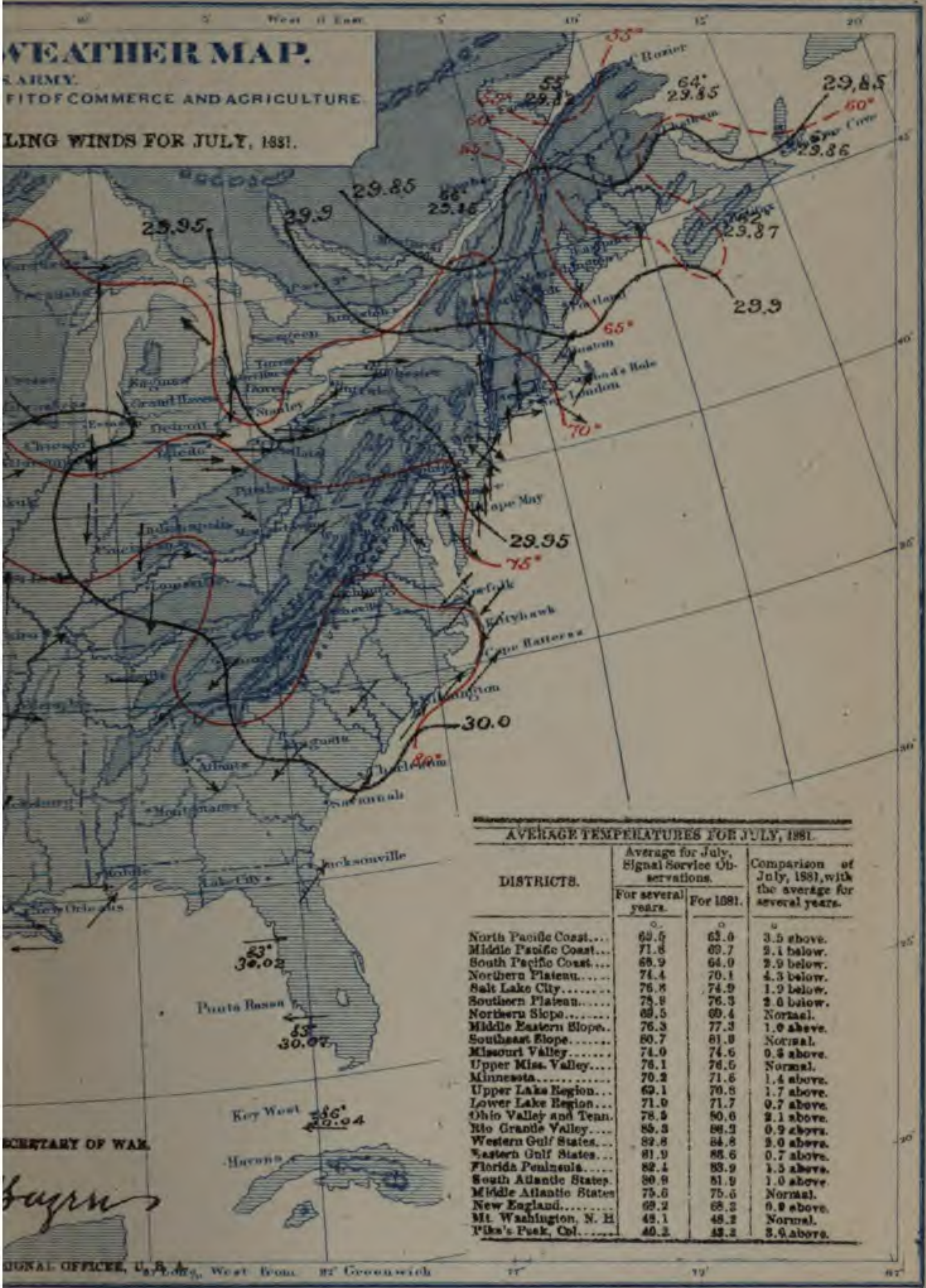


AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN.

No.	Velocity.
I.	37.5 miles per hour.
II.	32 do.
III.	27.5 do.
IV.	21 do.
V.	34 do.

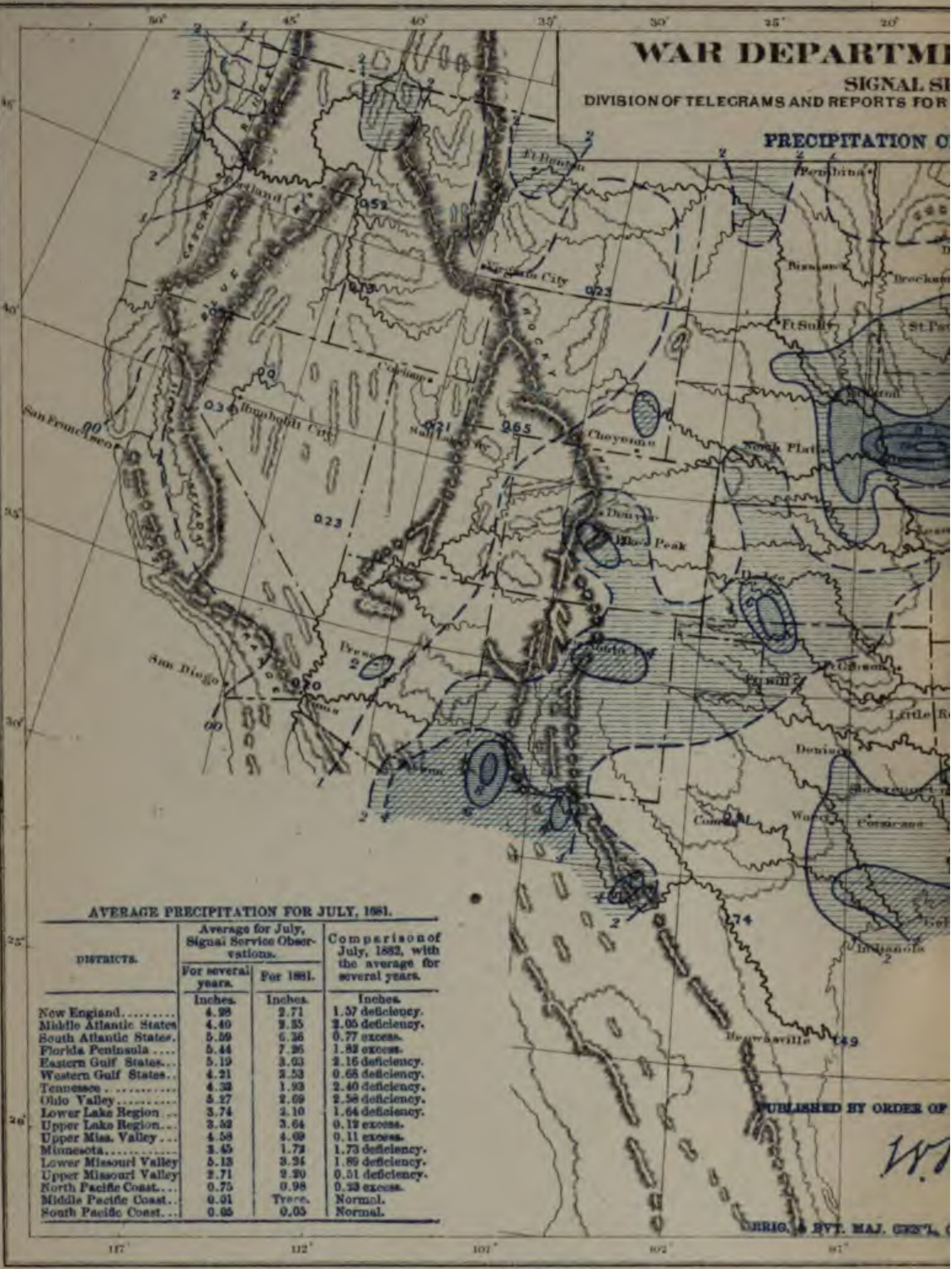
No. II.



AVERAGE TEMPERATURES FOR JULY, 1881.

DISTRICTS.	Average for July, Signal Service Observations.		Comparison of July, 1881, with the average for several years.
	For several years.	For 1881.	
	°	°	°
North Pacific Coast....	59.5	63.0	3.5 above.
Middle Pacific Coast....	71.8	69.7	2.1 below.
South Pacific Coast....	66.9	64.0	2.9 below.
Northern Plateau......	74.4	70.1	4.3 below.
Salt Lake City.........	76.8	74.9	1.9 below.
Southern Plateau......	78.3	76.3	2.0 below.
Northern Slope.........	69.5	69.4	Normal.
Middle Eastern Slope..	76.3	77.3	1.0 above.
Southeast Slope.........	80.7	81.0	Normal.
Missouri Valley.........	74.0	74.6	0.6 above.
Upper Miss. Valley....	76.1	76.5	Normal.
Minnesota..............	70.2	71.6	1.4 above.
Upper Lake Region....	69.1	70.8	1.7 above.
Lower Lake Region....	71.0	71.7	0.7 above.
Ohio Valley and Tenn.	78.5	80.6	2.1 above.
Rio Grande Valley.....	85.3	86.2	0.9 above.
Western Gulf States....	82.8	84.8	2.0 above.
Eastern Gulf States....	81.9	82.6	0.7 above.
Florida Peninsula......	82.4	83.9	1.5 above.
South Atlantic States.	80.9	81.9	1.0 above.
Middle Atlantic States	75.6	75.5	Normal.
New England...........	69.2	68.2	0.9 above.
Mt. Washington, N. H.	48.1	48.2	Normal.
Pike's Peak, Col.......	40.2	43.8	3.6 above.

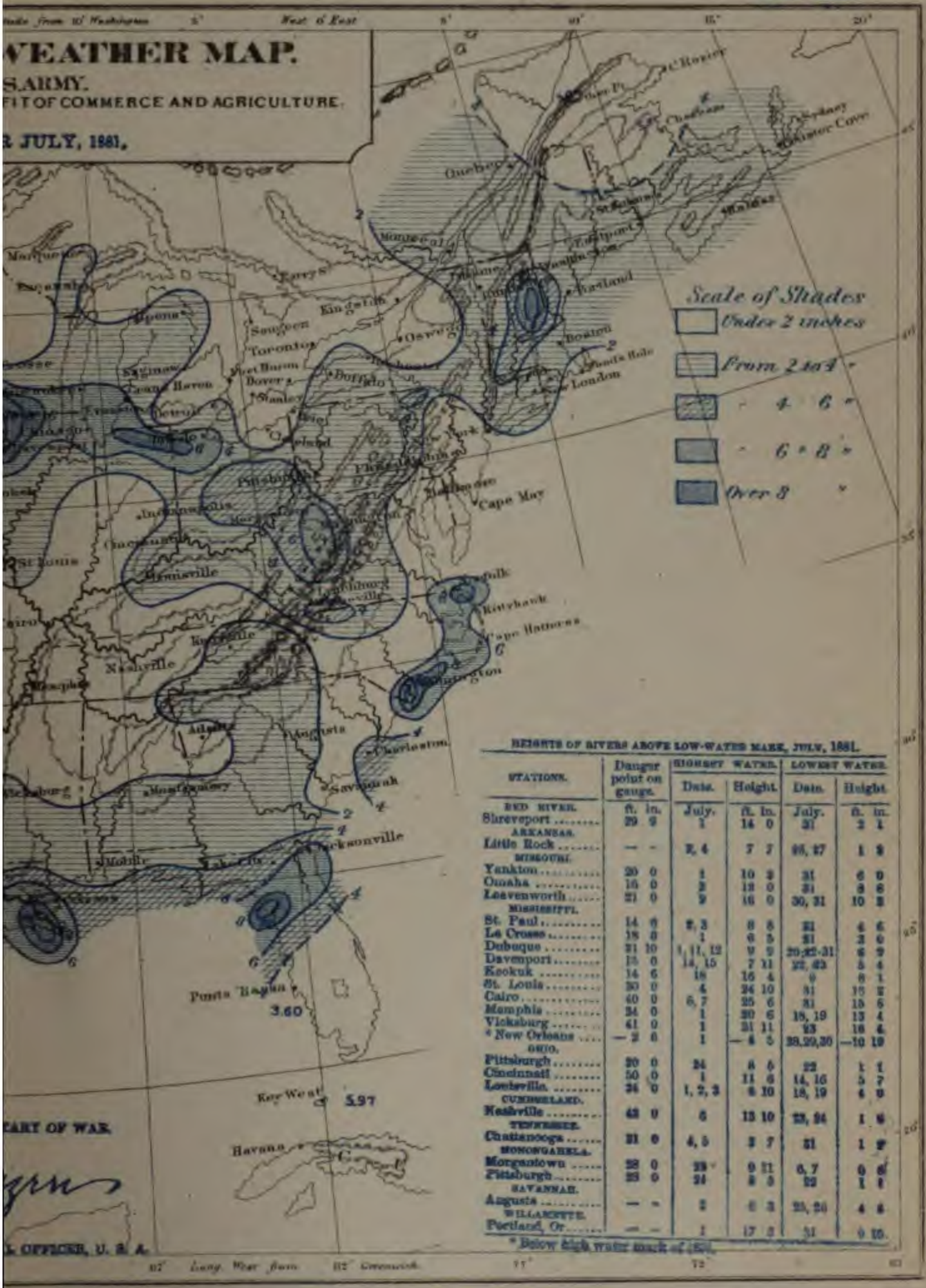
3



AVERAGE PRECIPITATION FOR JULY, 1881.

DISTRICTS.	Average for July, Signal Service Observations.		Comparison of July, 1882, with the average for several years.
	For several years.	For 1881.	
	Inches.	Inches.	Inches.
New England	4.28	2.71	1.57 deficiency.
Middle Atlantic States	4.40	2.35	2.05 deficiency.
South Atlantic States	5.59	6.36	0.77 excess.
Florida Peninsula	5.44	7.26	1.82 excess.
Eastern Gulf States	5.19	3.03	2.16 deficiency.
Western Gulf States	4.21	3.53	0.68 deficiency.
Tennessee	4.33	1.93	2.40 deficiency.
Ohio Valley	5.27	2.69	2.58 deficiency.
Lower Lake Region	3.74	2.10	1.64 deficiency.
Upper Lake Region	3.52	3.64	0.12 excess.
Upper Miss. Valley	4.58	4.69	0.11 excess.
Minnesota	3.45	1.72	1.73 deficiency.
Lower Missouri Valley	5.13	3.24	1.89 deficiency.
Upper Missouri Valley	2.71	2.20	0.51 deficiency.
North Pacific Coast	0.75	0.98	0.23 excess.
Middle Pacific Coast	0.01	Trace.	Normal.
South Pacific Coast	0.05	0.05	Normal.

No. III.



WEATHER MAP.

S. ARMY.

FIT OF COMMERCE AND AGRICULTURE.

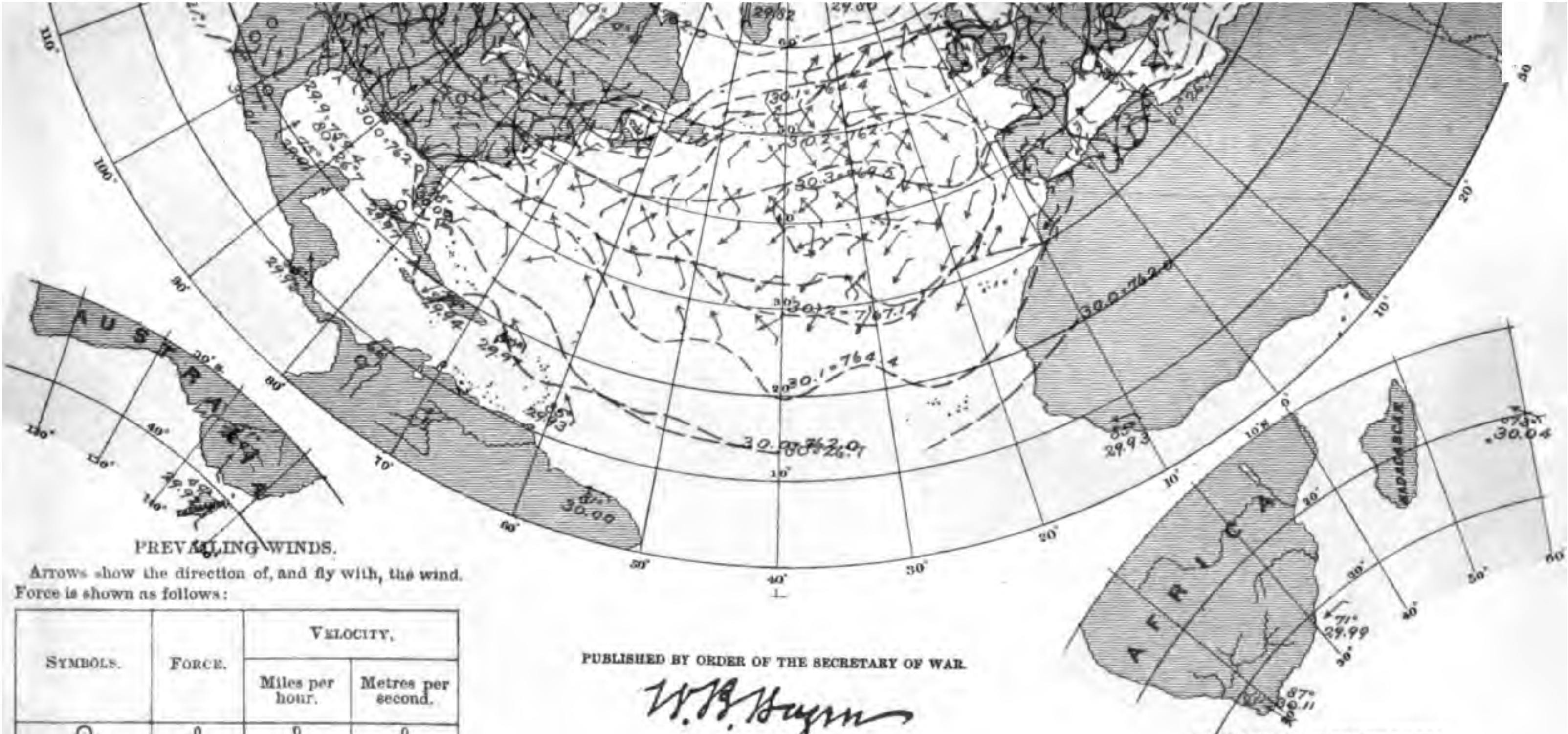
R JULY, 1881.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, JULY, 1881.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER.		
			Date.	Height.		Date.	Height.	
	ft.	in.	July.	ft.	in.	July.	ft.	in.
RED RIVER.								
Shreveport	29	9	1	14	0	31	2	1
ARKANSAS.								
Little Rock	—	-	2, 4	7	7	26, 27	1	3
MISSOURI.								
Yankton	20	0	1	10	3	31	6	0
Omaha	16	0	2	12	0	31	8	6
Leavenworth	21	0	9	16	0	30, 31	10	3
MISSISSIPPI.								
St. Paul	14	6	2, 3	8	8	31	4	6
La Crosse	18	0	1	6	5	31	3	6
Dubuque	21	10	1, 11, 12	9	9	20; 22-31	6	9
Davenport	15	0	14, 15	7	11	22, 23	5	4
Keokuk	14	6	18	16	4	9	8	1
St. Louis	30	0	4	24	10	31	15	2
Cairo	40	0	6, 7	25	6	31	15	6
Memphis	34	0	1	20	6	18, 19	13	4
Vicksburg	41	0	1	31	11	23	16	4
* New Orleans	—2	6	1	—4	5	28, 29, 30	—10	10
OHIO.								
Pittsburgh	20	0	24	8	6	22	1	1
Cincinnati	50	0	1	11	6	14, 16	5	7
Louisville	24	0	1, 2, 3	6	10	18, 19	4	9
CUMBERLAND.								
Nashville	42	0	5	13	10	23, 24	1	8
TENNESSEE.								
Chattanooga	31	0	4, 5	3	7	31	1	9
MONONGAHELA.								
Morgantown	22	0	23	9	11	6, 7	0	8
Pittsburgh	23	0	24	8	5	22	1	1
SAVANNAH.								
Augusta	—	-	2	6	3	25, 26	4	4
WILLAMETTE.								
Portland, Or.	—	—	1	17	3	31	0	10

* Below high water mark of [illegible].

4



PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind. Force is shown as follows:

Symbols.	Force.	Velocity,	
		Miles per hour.	Metres per second.
○	0	0	0
⁄→	1, 2	0 to 9	0 to 4.0
>→	3, 4	9.1 to 22.5	4.1 to 10.1
>⁄→	5, 6	22.6 to 40.5	10.1 to 16.1
>>→	7, 8	40.6 to 67.5	18.1 to 30.2
>>>→	9, 10	67.6 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL MONTHLY CHART.

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of May, 1879, based on the daily charts of the International Bulletin

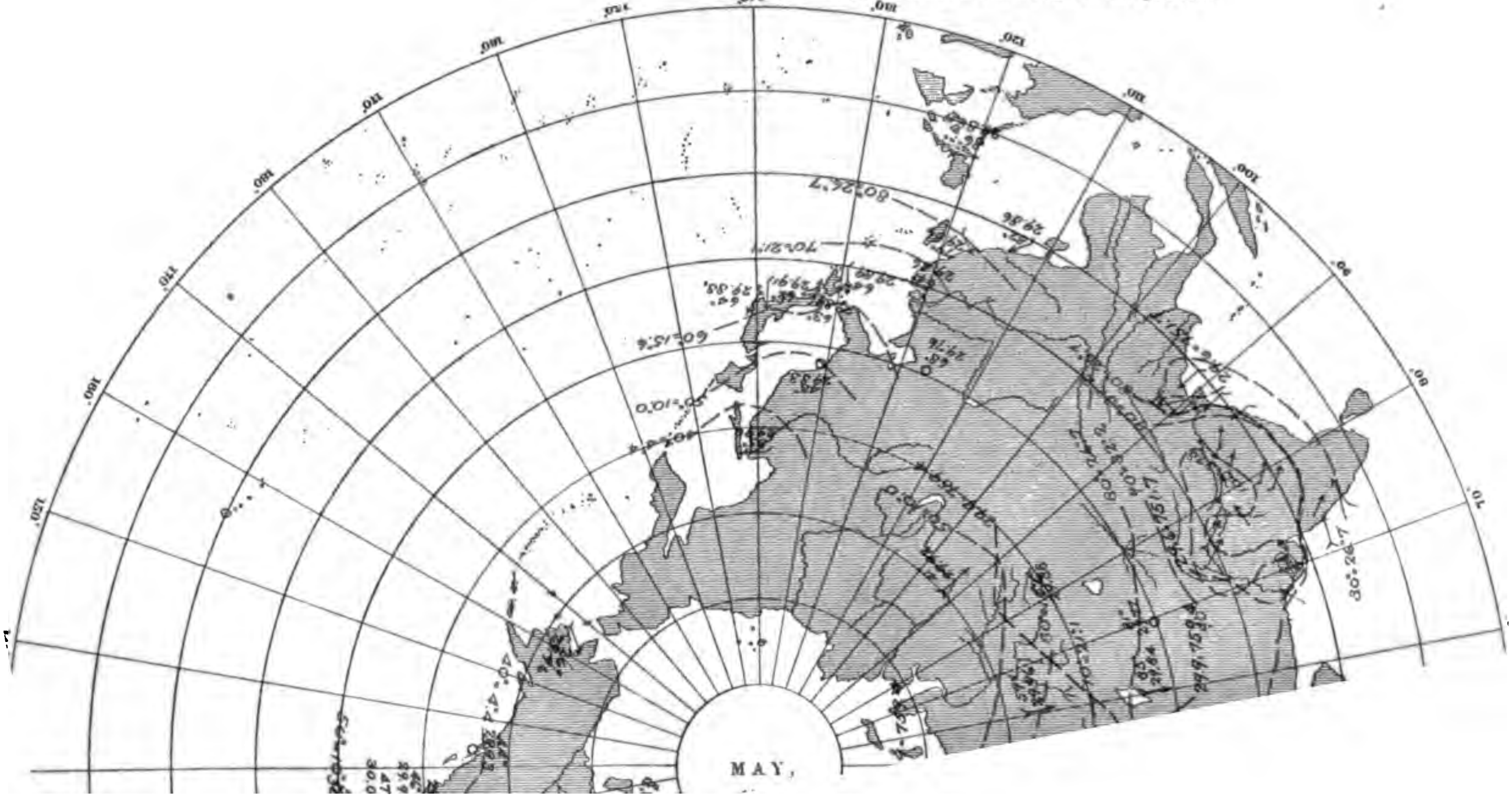
ISOBARS AND ISOTHERMS.

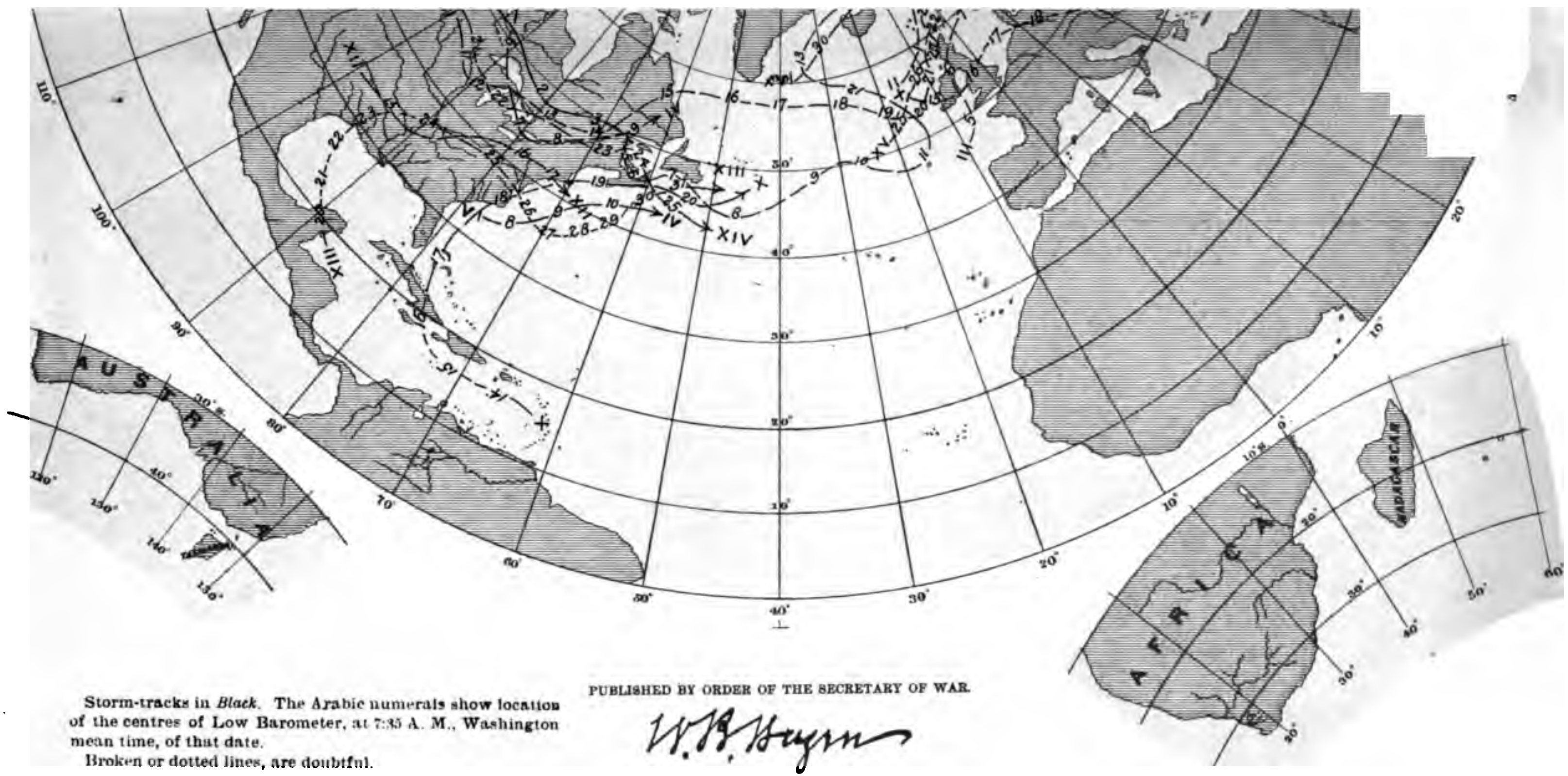
Isobars in *blue* detached barometer means in English inches.

Isotherms in *red*; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.

... simultaneously, Series commencing January, 1877.





Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.
Broken or dotted lines, are doubtful.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

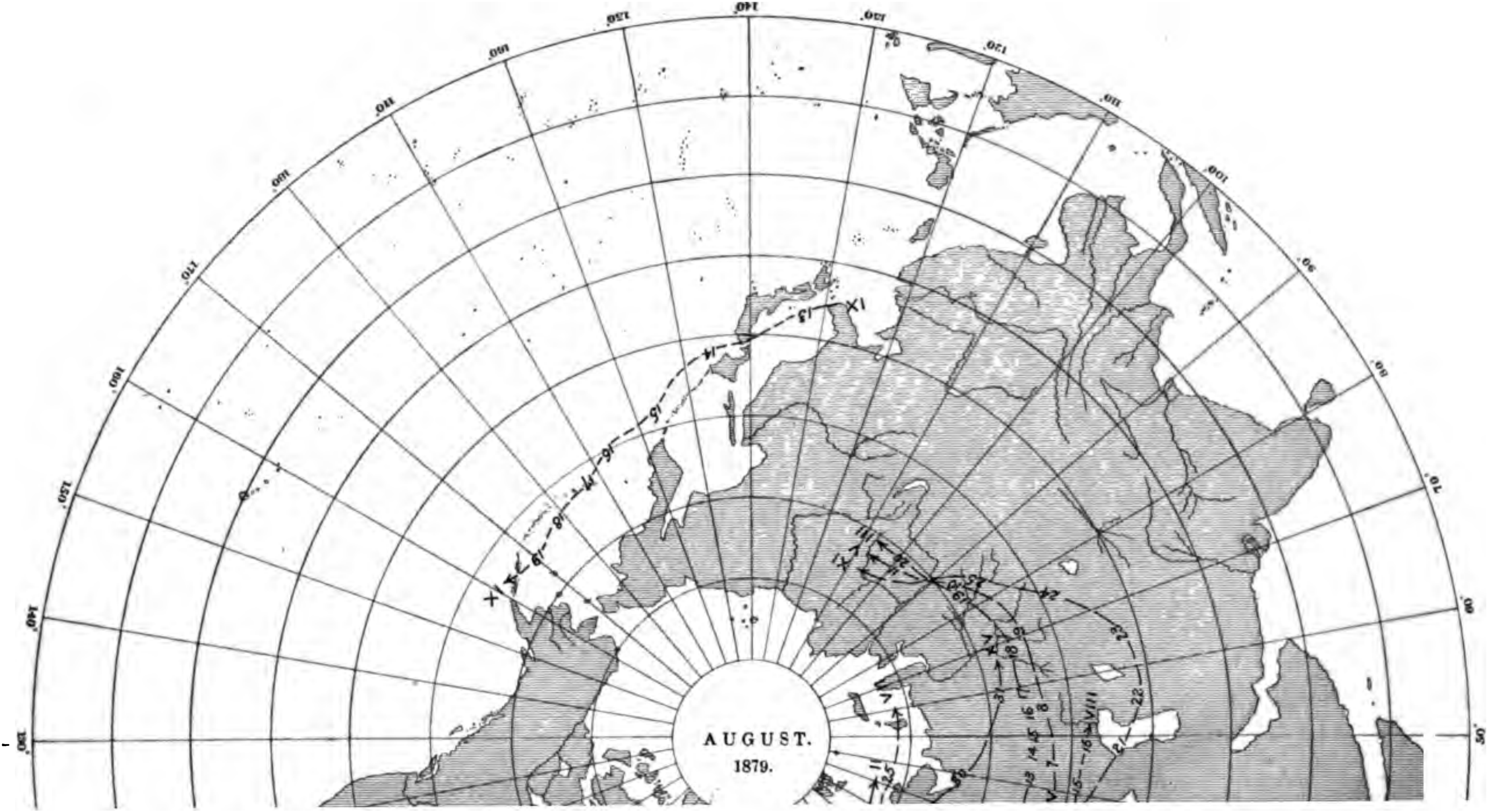
INTERNATIONAL CHART.
Showing Tracks of Centres of Low Barometer for
August, 1879.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. VI.



Sun spots.—The following record of observations, made by Mr. D. P. Todd, assistant, has been forwarded by Prof. S. Newcomb, United States Navy, Superintendent Nautical Almanac Office, Washington, D. C.:

DATE—July, 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 5 p. m..	1	2	0	0	1	2	6	†45	Many of the spots small.
2, 8 a. m..	0	0	0	0	0	0	6	†40	
3, 5 p. m..	1	5	0	5	1	5	7	†35	
4, 1 p. m..	0	0	1	5	0	0	6	†25	
5, 9 a. m..	2	10	0	0	0	0	8	†35	
6, 11 a. m..	0	0	1	5	0	0	6	†25	
8, 8 a. m..	1	10	1	5	1	5	6	†30	
9, 6 p. m..	0	6	1	1	0	6	5	†35	
10, 11 a. m..	1	1	0	0	1	1	5	†35	
11, 8 a. m..	0	0	0	0	0	0	5	†30	
12, 4 p. m..	0	0	0	0	0	0	4	†25	
14, 7 a. m..	0	0	0	5	0	0	4	20	
16, 10 a. m..	0	5	1	5	0	0	2	†20	
17, 12 m.. ...	1	3	0	5	1	3	3	15	
18, 6 p. m..	1	3	0	5	0	0	4	13	
19, 11 a. m..	0	4	0	2	0	0	4	15	
21, 6 p. m..	1	5	1	5	1	2	4	15	
23, 8 a. m..	4	15	0	5	2	10	8	†25	
24, 9 a. m..	0	†20	1	5	0	0	7	†40	
25, 5 p. m..	0	†25	0	0	0	0	7	†65	Many of the spots small.
26, 9 a. m..	0	0	0	5	0	0	7	†60	Many of the spots small.
28, 8 a. m..	1	10	1	5	1	2	7	†65	Many of the spots small.
29, 8 a. m..	1	2	0	5	1	2	8	†65	Many of the spots small.
31, 10 a. m..	2	5	1	5	2	5	8	†60	

†Approximated. Faculæ were seen at the time of every observation.

Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: Spots observed every day during the month, most numerous, 1st; fewest 17th; largest, during the latter part of the month. Mr. D. Trowbridge, at Waterburgh, N. Y., reports as follows: 1st, 5 groups, 9 spots, 1 group just appearing by solar rotation; 2d, same as observed on 1st, 7 spots; 5th, 2 groups, 3 spots, 1 new group appeared by solar rotation; 6th, 3 groups, 7 spots, 1 group near the middle of the disk, not seen on the 5th; 9th, 5 groups, 6 spots, 1 group just appeared by rotation; 11th, 3 groups, 7 spots, 2 were bright and large; 12th, 4 groups, 6 spots, 3 groups same as observed on 11th, and one new small spot; 13th, 4 groups, same as observed on 12th, 5 spots; 15th, 2 groups, 3 spots, 1 group disappeared by rotation and one gone out; 16th, 1 group, 4 spots, 1 group gone out; 18th, 3 groups, 3 spots, largest group observed on the 16th, has disappeared by rotation, 2 groups supposed to have appeared by rotation; 19th, 2 groups, 5 spots; 21st, 3 groups, 4 spots; 22d, 4 groups, 4 spots, 1 new group appeared by rotation; 24th, 5 groups, 8 spots; 25th, 4 groups, 13 spots, same groups as observed on 24th; 26th, 5 groups, same as 25th; 28th, 4 groups, 9 spots, cloudiness interfering with observation; 30th, 7 groups, 19 spots, 1 very fine group; 31st, 6 groups, 10 spots, some changes.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

APPENDIX No. 77.

MONTHLY WEATHER REVIEW, AUGUST, 1881.

INTRODUCTION.

In preparing this review the following data, received up to September 20, have been used, viz, the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 185 monthly journals and 180 monthly means from the former, and 15 monthly means from the latter; 201 monthly registers from voluntary observers; 50 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of August, 1881, is shown by isobaric lines (in black) upon Chart No. II. The areas of lowest barometric mean cover the Upper Missouri Valley, extreme Northwest, Texas, and California. Within these districts the pressure ranges from 29.72 to 29.94. East of the 95th meridian the mean nowhere falls below 29.93, which reading occurred at only one station, Charlottetown, P. E. I. The area of highest mean pressure (30.03 to 30.06) prevails over the lower peninsula of Michigan and thence southeastward to the Atlantic. On the Pacific coast the barometer ranges from 29.83 at Visalia to 30.04 at Roseburgh. The following high readings are reported from elevated stations where reduction to sea level is uncertain: Pike's Peake, 30.26; La Mesilla, N. Mex., 30.25; Fort Davis, Tex., 30.19. Compared with the preceding month the pressure east of the 100th meridian, except along the immediate Gulf coast, is higher, the excess ranging from 0.01 to 0.12 inch. On the Gulf and Pacific coasts and over the Rocky Mountain and Plateau Districts there is a deficiency of from 0.02 to 0.11 inch, the greatest change occurring over the Florida peninsula.

Departures from the normal values for the month.—Compared with the means for previous years the mean pressure of the present month is from 0.01 to 0.07 inch below the average in Tennessee, the Gulf and South Atlantic States. Throughout the Missouri Valley there is a deficiency of from 0.01 to 0.04 inch. Westward from Denver and Cheyenne along the 40th parallel to California, the deficiency is 0.02 inch. Another area of deficiency, and where the departure ranges from 0.01 to 0.03 inch, prevails along the New England coast. Elsewhere the comparison displays a normal condition, or an excess of 0.01 to 0.08 inch, the greatest variation being found in the Middle Pacific coast and Upper Lake regions. Stations reporting a normal condition are as follows: Boston, Corsicana, Dodge City, Des Moines, Indianapolis, Knoxville, New Orleans, Olympia, Philadelphia, Springfield, Ill., and Saint Paul.

Barometric ranges.—The range of pressure for the month has generally varied from 0.3 to 0.6 inch, and in the extremes from 0.16 inch at Silver City, N. Mex., to 0.83 inch at Eastport. Throughout the several districts the monthly barometric range varied as follows: New England, 0.71 inch on Mount Washington to 0.83 at Eastport; Middle Atlantic States, 0.56 at Lynchburg to 0.80 at New York; South Atlantic States, 0.46 at Smithville to 1.05 at Savannah; Eastern Gulf States, 0.31 at New Orleans to 0.52 at Montgomery; Western Gulf States, 0.23 at Denison to 0.44 at Indianola; Rio Grande Valley, 0.25 at Eagle Pass to 0.36 at Laredo and Brownsville; Ohio Valley and Tennessee, 0.40 at Louisville and Nashville to 0.57 at Morgantown; Lower Lake region, 0.53 at Toledo and Sandusky to 0.67 at Rochester; Upper Lake region, 0.52 at Milwaukee and Grand Haven to 0.74 at Duluth; extreme Northwest, 0.72 at Fort Buford to 0.82 at Moorhead and Saint Vincent; Upper Mississippi Valley, 0.41 at Des Moines to 0.62 at Saint Paul; Missouri Valley, 0.34 at Leavenworth to 0.80 at Fort Bennett; Northern Slope, 0.41 at Cheyenne to 0.65 at Fort Assinniboine; Middle Slope, 0.22 at Fort Elliott to 0.45 at Pike's Peak; Southern Slope, 0.19 at Concho to 0.41 at Jacksborough; Northern Plateau, 0.36 at Eagle Rock to 0.58 at Fort Missoula; Middle Plateau, 0.29 at Pioche to 0.39 at Winnemucca; Southern Plateau, 0.16 at Silver City to 0.28 at Phœnix; North Pacific coast, 0.30 at Roseburgh to 0.36 at Portland; Middle Pacific coast, 0.42 at San Francisco and Sacramento to 0.43 at Red Bluff; South Pacific coast, 0.23 at Campo to 0.44 at Visalia.

Areas of high barometer.—Three such areas are described:

No. I.—An area of high barometer appeared over the Northern slope on the morning of the 6th, the barometer having risen 0.40 inch at Moorhead and 0.39 inch at Huron. The winds in the Missouri and Upper Mississippi Valleys had shifted to northerly, and the temperature over these regions had fallen from 4° to 9°, and at Huron 19°. Frost occurred at Saint Vincent. The area moved eastward during the 6th and 7th, and on the morning of the 8th was central over Lake Erie. It then passed to the south, the pressure diminishing. The pressure remained highest and above the normal in the Gulf States until the 10th. The following minimum temperatures occurred: Saint Vincent, 36°; Moorehead, 45° on 6th; Milwaukee, 52°; Alpena, 48°; Port Huron, 48°; Toledo, 55°; Sandusky, 59° on the 8th.

No. II.—With the pressure over the country below the normal the barometer began to rise over the Northern slope on the 11th, and continued until the morning of the 13th. Then appeared an area of 30.10 following low area No. III. It was central at Duluth on the morning of the 14th, the barometer at that station being 0.27 inch above the normal. The winds had shifted to north or northwest in the Lake Region, the Middle Atlantic and New England States, with rain in the Lower Lakes on the 13th, and in the Middle Atlantic States on 13th and 14th. On the morning of the 15th it appeared as an area of 30.20 over the Upper Lake region, and during the day moved to the east over Ontario and Quebec. On the afternoon of the 17th it was over New Brunswick, the barometer at Chatham being 0.44 inch above the normal. It then disappeared, the pressure falling below the normal in New Brunswick during the night of the 19th. The following minimum temperatures occurred: Omaha, 59° on the 12th; Bismarck, 49° and Leavenworth 63° on the 13th; Yankton and Saint Paul, 52° on the 14th; on the 15th, Duluth and Madison, 52°; Marquette, 41°; Escanaba, 42°; Detroit and Grand Haven, 53°; Champaign and Springfield, Ill., 54°.

No. III.—Following area of low barometer No. V, an area of 30.10 appeared in the Northwest on the 18th, with the highest pressures at Saint Paul and Saint Vincent. The pressure remained highest in the extreme northwest until the 20th. An eastward movement commenced on this day. At midnight of the 21st the highest pressure was at Marquette. On the 22d it was at Alpena. On the 23d it extended over the maritime provinces and part of New England, and on the 24th it appeared as an area of 30.30 on the New England and Middle Atlantic coasts. Here the pressure remained highest until the 30th, gradually extending into the South Atlantic States after the passage of low area No. VI to the northwest. To the presence of this high area on the Atlantic coast we may attribute the very unusual path of storm No. VI. When the latter area reached the South Atlantic coast there was a low area in the extreme Northwest, with the barometer below the normal at all points between. To the northeast of low area No. VI, the direction in which storms of this class usually move, often recurving, the pressure was high. Under these circumstances, unable to recurve in the usual latitude, the storm was carried off to the northwest with diminished energy, and the Middle Atlantic and New England coasts escaped a cyclone of destructive violence. The following minimum temperatures are noted in connection with this area: Burlington, Vt., 50°, 25th; Eastport, 51°, 25th, 27th; Morgantown, 52°, 24th; Baltimore, 60°, 28th; Lynchburgh, 62°, 27th; Charlotte, 64°, 26th; Charleston, 69°, 26th, 27th; Atlanta, 65°, 31st; Key West, 74°, 30th.

Areas of low barometer.—Six such areas are described for the month of August, 1881; five of them are charted. No. VI is specially noted for its very unusual path, its energy and the extensive destruction of property and lamentable loss of life caused by it.

No. I.—(Not charted.) High winds accompanied by heavy rain prevailed at intervals, and with variable intensity at the Gulf ports, from Indianola to Pensacola, from the 1st to the 8th. The following is the report of velocities and rainfall: Port Eads, 34 miles on 1st; 29 miles on 2d; 40 miles on the 3d; 27 miles on the 5th; 7.12 inches rain fell between midnight of the 4th and the morning of the 6th. Pensacola, 32 miles on the 2d; 40 miles on the 3d; 28 miles on the 5th; 10.41 inches rainfall on 2d and 3d; 5.54 inches rainfall on 4th and 5th. Mobile, 40 miles on 8th; 6.20 inches rainfall on the 3d, and 6.66 inches on the 4th and 5th. Indianola, 30 miles on the 1st, and 38 miles on the 6th. Signals for this storm were ordered as follows: Port Eads—up, morning of 2d; down, midnight of the 3d; up, morning of the 7th; down, morning of the 8th. Mobile—up, morning, 2d; down, midnight, 3d. Pensacola—up, morning, 2d; down, midnight, 3d. Cedar Keys—up, morning, 2d; down, morning, 3d; maximum velocity, E. 16 miles. Indianola—up, morning, 7th; down, midnight, 8th; velocities, 56 miles on the 7th; 25 miles on the 8th.

No. II.—On the 6th the barometer commenced to fall over the Northern Slope, and the fall continued during the 7th. The morning report of the 8th showed the area to be central near Moorhead. From this date the path of center is charted until it disappeared over New Brunswick, on the 10th. A velocity of 25 miles was reported from Grand Haven on the 8th, and 28 miles on the 9th. There were light rains in the Lower Lake region on the 9th, and general rains in New England, the northern part of the Middle Atlantic States and in the Canadian maritime provinces on the night of the same date, followed by clearing and fair weather and cool NW. winds on the 10th.

No. III.—Followed immediately after the high barometer that succeeded No. II. On the afternoon of the 10th, when No. II was central and disappearing over New Brunswick, No. III was central near Fort Assinniboine. During the night of the 10th and on the 11th the storm moved as far east as Prince's Landing, on Lake Superior, accompanied by rain in the Upper Lake region. Cautionary signals were ordered up at Grand Haven, Milwaukee, Escanaba, Marquette, and Duluth on the morning of the 11th. Justified at station, at Grand Haven, S. 28 miles; Marquette, SW., 26 miles, and at Escanaba and Milwaukee, by velocities of over 25 miles within one hundred miles. Duluth not justified. Signals were down on morning of 12th. The storm was central near Rockliffe at midnight of the 12th, and moved off to the NE. over New Brunswick on the 13th. Rain fell in the Lower Lakes, New England, and the maritime provinces on this date, and in the New England and Middle Atlantic States on the 14th.

No. IV.—A storm, whose path can only be charted for a short distance, passed from the Gulf of Mexico across the southern end of Florida on the 17th. The following velocities are reported: Port Eads, 25 miles on the 16th; Cedar Keys, 27 miles on the 17th; Punta Rassa, 28 miles on the 17th; Key West, 27 S. miles on the 16th, and 28 miles NE. on the 17th. Heavy rain fell at Key West and Punta Rassa.

No. V.—The afternoon reports of the 16th showed an area of low barometer central in the Missouri Valley, NW. of Fort Bennett; the barometers at the river stations being from 0.10 to 0.20 inch below the normal. On the morning of the 17th the centre was near Yankton. Rain reported from Yankton and Bennett only. On morning of 18th the area was central in western Indiana, and by the morning of 19th had moved into Kentucky, south of Louisville, causing rain in the Upper Lake region, in Illinois, Indiana, Kentucky, Tennessee, and in the South Atlantic States. From this date it cannot be traced as a distinct area.

No. VI.—The following telegram from the Office of the Chief Signal Officer indicates the character of earliest information received by this office concerning the incipient formation of this storm, its probable course, and the effort to forewarn all maritime interests:

OFFICE CHIEF SIGNAL OFFICER, WASHINGTON, D. C.,
August 23d—10.15 p. m.

To the press and all sea-coast stations on the Atlantic coast:

It is reported to the Chief Signal Officer that a hurricane was central last night a short distance north or northeast of St. Thomas, West Indies, with a maximum hourly wind velocity of 60 miles; wind backing from northwest to southwest; one vessel blown ashore. The information given is insufficient to determine the path of the storm's centre, but it will probably move northwestward, and unless it recurves to the northeast will reach the South Atlantic coast. While storm signals will not be displayed at present, the Chief Signal Officer considers it advisable to send special warnings to all Atlantic ports and to caution shipping against possible danger from the hurricane for the next two or three days.

HAZEN.

The following collection of data relates to the destructive violence of the storm during its progress from a point north of St. Thomas northwestward to Savannah, Ga. Reports from vessels were very meager, owing to the delay with which such data is generally obtained. Schooner W. B. Mackie, from Wilmington, N. C., for Port au Prince, encountered a terrific storm on the western edge of the Gulf Stream during the night of the 23d, in which she lost her deck-load and sprung a leak. Schooner Lucie Wheatley, from Jacksonville for Baltimore, experienced from 21st to 24th, in about 32° N. 78° W., heavy cross seas, wind blowing a hurricane; 26th, storm increased in fury, threw over deck-load; 27th, noon, vessel full of water, masts swept away, hull wholly under water. Steamer City of Antonio, from New York for Galveston, experienced violent gales off Jacksonville during night of 27th; iron shutters stove in and saloon flooded. Ship Sandusky, in about 32° N. 76° W., experienced during 26th and 27th violent storm; vessel dismasted and all hands but two drowned. Bark Tupulco, 27th, in 30° 35′ N. 77° 26′ W., violent hurricane from NE.; lost foremast, jib-boom, maintopmast, and one seaman. Steamer Dessong, from Savannah for New York, night of 27th, 80 miles ESE. of Tybee Island, experienced violent northeast hurricane. Steamer Geo. W. Clyde, from New York for Charleston, reports: Left former port 4 p. m. of the 24th, wind SW., continuing in that direction until 7 p. m., when it shifted to NE. with increasing force. Passed

Hatteras 4 a. m. of the 26th, wind now veered to ENE. and increased to moderate gale; 7 p. m. off Cape Fear, wind ENE. blowing with hurricane violence; impossible to run ship before the wind; hove to and headed southeast; hurricane lasted for twenty-four hours, reaching its height about 10 p. m. of the 26th and continuing until 2 p. m. of the 27th with extraordinary violence. Steamer Saragossa, from Baltimore for Savannah, reports: Left former port 4 p. m. of the 25th, and on the morning of the 27th, about daybreak, encountered cyclone off Cape Lookout; wind SE. with a velocity of about 75 miles per hour, causing tremendous seas; no abatement of violence until late at night, when the wind slightly moderated, but the sea was still rough and exceedingly high. Morning of 28th (very early) gale began to subside with fine weather and clearing skies, but still experienced an ugly cross-sea setting in from the eastward; about 8 a. m., while to the southward of Cape Romain, experienced heavy cross-seas with gale from the SE. Schooner Hannah M. Lallis, 3 a. m. of 27th, in about 32° N. 78° W., encountered furious NE. to SE. gale and was entirely dismasted; most of the crew drowned. Bark Brunswick on 23d, and while over 100 miles east of Tybee Island, encountered a fierce hurricane from the NE. veering to SE.; 26th, violence of storm increased, vessel nearly dismasted; 27th, 8 a. m., gale continued with very little abatement; 1 p. m. lee yards under water, gale still very furious; between 5 and 6 p. m. slight lull in tempest followed in a short time by a recurrence of the gale redoubled in fury; 9 p. m. vessel disappeared beneath the waves, carrying down all but three of the crew. Bark Robinson Crusoe, 27th, in 34° 30′ N. 72° 30′ W., experienced violent hurricane from NE. to SE. Bark Georgiana, for Milford, Conn., left Charleston on 21st; on 22d and 23d met fresh gales from the NE. with heavy cross-seas, which continued with increasing violence; on the 24th put back to Charleston, vessel badly damaged. The following reports from West India land stations are of interest: 23d, 10 a. m., St. Kitts, SE., cloudy; Antigua, SE., hazy; Point-a-Pitre, SE., fine; Gaudaloupe, SE., fine; Dominica, rainy; Martinique, cloudy, calm; St. Lucia, fine, calm; St. Vincent, fine; Grenada, fine, calm; Trinidad, rainy; Barbadoes, barometer 30.12, wind E. 4 p. m., St. Kitts, SE., cloudy; Antigua, SE., hazy; Point-a-Pitre, calm; Gaudaloupe, calm and very hot; Dominica, very cloudy; Martinique, cloudy and calm; St. Lucia, calm and very hot; St. Vincent, fine and calm; Grenada, fine and calm; Trinidad, fine and calm; Barbadoes, barometer 30.05, wind E., fine. 24th, 10 a. m., St. Kitts, E., cloudy; Antigua, NE., hazy; Point-a-Pitre, calm; Guadaloupe, calm and hot; Dominica, cloudy; Martinique, fair; St. Lucia, cloudy and hot; St. Vincent, cloudy; Grenada, sky overcast, drizzling; Trinidad, fine; Barbadoes, barometer 30.14, E., fair. 4 p. m., St. Kitts, S., cloudy; Antigua, E., hazy; Point-a-Pitre, fair; Guadaloupe, calm, extremely hot; Dominica, cloudy, rainy; Martinique, rainy; St. Lucia, calm, hot; St. Vincent, calm; Grenada, calm; Trinidad, calm, hot; Barbadoes, barometer 30.05, wind W., fine. Reports from islands and other places adjacent to Savannah and along the neighboring coast give the following information concerning disasters: White Bluff, 27th, large number of dwellings, orchards and fine shade trees destroyed; Bryan Neck, 27th, fearful destruction of property; Dorchester, 27th, severest hurricane ever experienced; six persons and many cattle, sheep, and horses killed; houses, fences, trees, and crops leveled to the ground; nearly all the churches in the county destroyed; highways completely blocked with *débris*. Beaufort, 27th, violent wind commenced on night of 26th, culminating on the following day in a terrific cyclone, which demolished everything in its course; the water rose above the sea-wall and spread through the streets and into the cellars and basements of many buildings. Fleming, 27th, 9.30 p. m., tremendous gale from ENE., causing great destruction. Colonel's Island, 27th, all buildings of every kind swept away; ten persons drowned; crops washed out of the ground; trees uprooted and thrown about in great confusion, making roads impassable. Half Moon Bluff, 27th, the turpentine farms totally destroyed; houses, fences, and trees demolished. Egypt Depot, 26th, tremendous gale, with no abatement until the morning of the 28th. reaching its height about midnight of the 27th; great destruction to cotton crop; fields badly washed. Jessup, 27th, during night violent hurricane; houses, fences, and trees demolished; country roads in a deplorable condition, being blocked with trees and badly washed. Liberty County, Georgia, 27th, most terrific storm ever experienced; the extreme violence of the wind and the torrents of rain set in about 9 p. m., and continued till the following day; the destruction of forests was terrible; most of the trees, even the largest, were broken off at the trunks and twisted into splinters; the trunks, from three to five feet in diameter, were split into pieces about the size of rails; the highways everywhere were blockaded by fallen trees, and all communication cut off; buildings were in many instances lifted bodily from the ground and then crushed to pieces; huge pieces of timber were carried long distances by the force of the wind. An interesting peculiarity of the storm developed in this section of the State, which was shown by the destructive force of the wind being confined to wide streaks, running from southeast to northwest; the wind appeared to have bounded and rebounded like the waves of the sea; where the furrow of the air dipped there was a streak of destruction plainly marked for distances, in some instances of sixteen miles; in the interval between the streaks trees and buildings stood firm as though nothing had occurred. Montgomery, N. C., gale reached its height midnight of the 27th, as the wind veered to SE.; tide rose six feet above ordinary high-water mark, carrying away several large buildings; trees throughout the town were uprooted or broken off, and houses unroofed and otherwise demolished. Beaulieu, 27th, fences, trees, and houses in terrible ruin; roads leading into the country rendered impassable by hundreds of fallen trees, all of which were either torn up by the roots or twisted off at a height of ten to twenty feet above the ground. White Bluff, 27th, all bath-houses and boats swept away and several residences destroyed. Burnside Island, 27th, all dwellings and outbuildings unroofed or torn down; island nearly submerged. Shipyard Creek, 27th, everything flooded; nearly all buildings washed away. Wilmington Island, 27th, 11 houses blown down and all crops utterly destroyed; all through the woods and fields there were wrecks of furniture, houses, fencing, and boats; dead cattle and hogs frequently found. Cockspur Island, 27th, everything swept away; the loss is terrible and unprecedented. Bonaventure, 27th, streets filled with the *débris* of trees, fences, and buildings; in the cemetery several large tombstones were broken in pieces. Long Island, 27th, every building carried away save the light-house; the heavy sea burst open the door of the main portion of the latter, used as a residence, and carried away doors, windows, furniture, clothing, and all supplies on hand. Hogg Island, 27th, 15 houses carried away and 25 persons drowned; all crops destroyed. William's Island, 27th, 20 houses carried away and 15 persons drowned; mules, horses, and other stock lost; rice crops nearly destroyed. Rabbitt Island, 27th, island nearly submerged; all buildings and crops destroyed. Hutchinson's Island, 27th, 18 persons drowned and all buildings swept away. Fig Island, 27th, 13 persons drowned and every plantation destroyed; all huts on either side of the river carried off by the high water and the occupants drowned. McQueen's Island, 27th, all buildings and crops badly damaged. Charleston, 27th, most violent since the great storm of August, 1874; in eastern and southern parts of city wharves greatly damaged; section of city east of East Bay, including about fourteen squares, submerged to a depth of several feet; much property in the southwestern portion of the city under water; roofs, window-shutters, fences, shade trees, and gates, generally destroyed; all telegraph wires down; business seriously interfered with; loss variously estimated at from $200,000 to $300,000. Sullivan's Island, 27th, storm burst upon the island early in the morning, displaying unexampled fury; miles of fencing were blown down, and from 8 to 10 houses destroyed; entire loss estimated at $40,000. Port Royal, S. C., 27th, ferry house carried away by the extremely high tide, and from 20 to 40 people drowned; the gale was one of the most violent ever experienced. Tybee Island, 27th, at 6 a. m. wind reached an estimated velocity of 80 miles per hour; whole rows of cottages were destroyed, and the strongest houses were unroofed or crushed in by the terrific force of the hurricane; bathing-houses, pavilions, and various outbuildings were swept clear from the beach and carried in shapeless masses through the woods; the ruins in some instances took fire, causing a frightful loss of life. Bethesda, 27th, storm raged with great fury until 1.30 a. m. of the 28th; ground strewn with the wrecks of trees, fences, and buildings; all highways obstructed by huge piles of *débris;* railroad and telegraphic communication cut off. Moorehead City, N. C., 24th, over thirty hours in advance of the storm the skies became blackened with sea birds of every kind, size, color, and description, moving rapidly towards the west, as if fleeing from the violence of the coming storm. The strange conduct of the birds was equaled, if not surpassed, by the finny tribe, as shown by the latter's rapid flight up Newport River, a narrow, turbid stream. All through the day the fish, in schools of millions, passed up the stream, followed by great droves of porpoises, so thick that the river looked like a slowly moving stream of ink. 27th, birds slowly returning; at Newport, where the stream is very narrow, the fishes and porpoises were so wedged in that they could not move either up or down. The above incident would appear to give evidence of the possession of a wonderful instinct by birds and fishes. Elba Island, 27th, every house and outbuilding carried away; all crops destroyed; 15 to 20 persons drowned. Fort Pulaski, 27th, storm raged for six hours with demoniac fury; water rose one foot above the floor of the officers' quarters; all houses on the island, as well as every head of cattle, were swept away. Savannah, 26th, during the day it was blustering and very threatening, barometer rapidly falling, wind NE.; through the night the velocity and violence of the wind increased, direction ENE., tide extremely high; at Tybee Island there was a perfect gale from the NE., veering to SE.; 27th, 6.44 a. m., barometer 29.70; 10.44 a. m., 29.61, N., 32 miles; 2.44 p. m., 29.48, N., 36 miles; 6.44 p. m., 29.30, NNW., 33 miles; 7 p. m., NE., 35 miles; 8 p. m., NNE., 48 miles, rain falling in sheets; 8.45 p. m. fierce gusts of from 60 to 80 miles per hour from the NE., accompanied by a deafening roar and the crash of falling buildings; barometer continued to fall rapidly until, at 9.20 p. m., it reached the minimum of 29.08, where it remained about stationary for 20 minutes; the pressure now began to recover quickly, and at 10.44 p. m., barometer read 29.17, wind SE., about 50 miles per hour; midnight, 29.34, SE., 36 miles per hour; 28th, 2 a. m., 29.49, SE., about 28 miles per hour. Damage to property in the city estimated at $1,500,000. On the morning following the storm there was presented the most terrible scene of wreck, ruin, and death that was ever witnessed within the memory of the oldest inhabitant; the memorable storm of 1854 was not as violent or prolonged; streets everywhere were completely blockaded with large trees, huge piles of tin roofing, bricks, and parts of buildings; hardly a building in the city but received more or less injury; in and about the city over 300 negroes were drowned, and 35 white persons killed or drowned; along the immediate coast nearly 100 vessels were wrecked. At Bohanville, in southeastern part of city, 20 houses were unroofed and 12 completely demolished; all shade trees and fences blown down; the force of the wind was sufficiently great to drive the sea water up the Savannah River, far above the city; nearly every house received a copious supply of salt water, causing great inconvenience; all creeks leading inward from the sea rose to a great height and flooded the adjacent lowlands. Reports from 47 rice plantations on the Cowbahee, Ashepoo, and Edisto rivers, Rautowles Creek, and the eastern and western branches of Cooper River state that only three plantations escaped with slight loss, while the remainder were almost or entirely submerged with salt water; loss can hardly be estimated. In advance of this storm cautionary signals, on the morning of the 25th, were ordered for the following stations, and justified by the accompanying maximum velocities: Smithville, E., 50 miles; Wilmington, E., 27; Fort Macon, E., 38; Hatteras, NE., 34; Kitty Hawk, E., 32; Cape Henry, NE., 32; these signals were lowered on the morning of the 28th. At other Atlantic coast stations signals were ordered on the 26th and partly justified, as follows: Cedar Keys, noon, SW., 27 miles; Jacksonville, a. m., SW., 37; Savannah, a. m., NE., 60; Charleston, NE., 54; Norfolk, p. m., E., 14; Baltimore, midnight, S., 9; Chincoteague, p. m., SE., 22; Delaware Breakwater, p. m., E., 16; Cape May, midnight, SE., 17; Atlantic City, midnight, E., 10; Barnegat, midnight, SE., 13; Sandy Hook, midnight, SE., 24. All of these signals were lowered on the morning of the 28th, except at Cedar Keys, which remained up until p. m. of 29th, owing to damage to telegraph lines, but was ordered down p. m. of the 28th. By the morning of the 28th the storm had moved westward into central Georgia with diminished violence. On the morning of 29th the center was near Memphis, the barometer at that station being 0.35 inch below the normal; heavy rain had fallen along the path of storm. The next morning the center had moved into Iowa, and thence passed off to the north and east.

INTERNATIONAL METEOROLOGY.

International Charts Nos. V and VI accompany the present Review. The former is published for the month of June, 1879, continuing the series of this chart begun in January, 1877. Chart No. VI is prepared for the month of September, 1879, continuing the series of this chart begun in November, 1877.

Chart No. V shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m. Washington, or 0.43 p. m. Greenwich, mean time, for the month of June, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. The area of 29.80 covers western Asia, the most of Europe north of the 40th parallel, and the Atlantic north of the 45th parallel and west of the 35th meridian. Within this vast area of comparatively low pressure appear two small areas of lower barometric minima, viz, 29.60 covering northwestern Siberia, and 29.70 embracing the western half of the British Isles, together with that portion of the ocean included between the 50th and 60th parallels and east of the 25th meridian. The pressures over central and southern Europe range from 29.85 in Austria to 30.06 in Spain. In Turkey and Asia Minor the barometer is generally below 29.90; in Toorkistan, 29.65 to 29.91; in Hindostan, 29.43 to 29.77; along the Asiatic coast, 29.67 to 29.87. Over North America the regions of lowest pressure embrace the Canadian maritime provinces, barometer generally below 29.90, and that portion of territory between the meridians of 93° and 103° W., extending from Texas northward to the British Possessions, pressure ranging from 29.79 at Pembina to 29.99 at Galveston. The lowest mean pressures of the month are reported from the following stations: Lahore, 29.43 (747.5); Roorkee, 29.45 (748.0); Lucknow, 29.46 (748.4); Ekaterinburg, 29.55 (750.6); Barnaul, 29.60 (751.7); Kasan, 29.61 (752.1); Galway, 29.62 (752.3); Armagh, 29.66 (753.3); Monach Light-house, 29.67 (753.5); Stykkisholm, 29.78 (756.4); Fort St. Michael's, 29.84 (757.8). The area of highest pressure, 30.20, covers the Atlantic between the meridians of 23° and 52° W. and the parallels of 23° and 35° N. The area 30.10 reaches eastward into Algeria, westward to the 77th meridian, northward to the 40th parallel and southward to 17° S. Over North America the isobar of 30.10 embraces a small area in central Mexico and in the Northern Pacific coast region. The following are the highest readings from isolated stations: Funchal, 30.19 (766.7); Melbourne and Ponta Delgado, 30.15 (765.7); Mauritius, 30.14 (765.5); Cape Town, Angra, and Mogador, 30.12 (765.0). The extreme monthly range of mean pressure is 0.84 inch, which is 0.15 inch above that for June, 1877, but 0.09 inch below that for June, 1878. The maximum and minimum mean temperatures, given in Fahrenheit's scale, are reported from the following stations: highest, Fao, 100°; Biskra, 99°; Lagouat, 98°; Lahore, 97°; Deesa and Agra, 96°; Bridgetown, 83°; Free Town, 85°; Murcia, 89°; lowest, Godthaab, 41°; Hobart Town, 43°; Tromso, 46°; Stykkisholm, Farther Point, Virginia City, and Sitka, 48°; Nikolaievsk on the Amoor, Moose Factory, and Olympia, 49°; North Unst, 50°. The prevailing direction of the winds was, over the United States, southwesterly in the Atlantic Coast States; southeasterly in the Gulf States, Upper Mississippi and Lower Missouri Valleys; northerly over the Lake region and Canada; westerly on the Pacific coast; elsewhere variable. Over the Atlantic Ocean, south of the 30th parallel, northeast to southeast; north of that parallel, southwest to northwest and northeast. Over northern Europe southwest to northwest; over southern Europe southwesterly. In Algeria, variable. Along the Asiatic coast, southerly. Compared with the mean of the past two years, June, 1877 and 1878, the temperature and pressure over the United States, in general, bear a very close resemblance in every district. Over the Lake region the temperature is from 2° to 5° above the mean. In Canada and the maritime provinces there is a decline of from 2° to 7°. The pressure over the Lake region, Tennessee, and the Ohio Valley is from 0.03 to 0.10 inch higher; elsewhere slight deviations from the mean or the existence of a normal condition. Over the Atlantic comparison can only be made with 1878. Upon examination it is found that the positions of the areas of highest pressure nearly coincide, that is, if the area of 30.20 alone is considered; but in June, 1878, a very small area of 30.30 occupied the ocean in the vicinity of 26° N. 47° W., the maximum pressure being but 0.03 inch above the highest reading for June, 1879. Between the parallels of 50° and 60° N. and the meridians of 10° and 40° W. the pressure is from 0.10 to 0.15 inch lower. Along the parallel of 40° N. the conditions of pressure remain about the same. The temperature is considerably lower south of parallel 35° N. and north of parallel 50° N., while between these boundaries the difference is in favor of a rise of from 1° to 5°. Over the British Isles the pressure is from 0.14 to 0.25 inch below the average, and the temperature shows a decrease of from 2° to 6°. In central and western Europe (excluding Spain) the pressure is from 0.02 to 0.15 inch below the average, while the temperature ranges from normal to —4°. Over Scandinavia the pressure is from 0.07 to 0.15 inch below the average, and the temperature from +1° to —4°. In Algeria the pressure ranges from —0.08 inch to +0.02 inch, and the temperature from +2° to +4°. Over Spain and Portugal the pressure ranges from normal to —0.06 inch, and the temperature from normal to —3°. Over Russia, south of the 60th parallel, the pressure ranges from —0.06 to —0.22 inch, and the temperature from —7° +3°. In Hindostan the pressure ranges from +0.02 to +0.07 inch, and the temperature from —3° to —8°. The following deviations from the average in temperature and barometer, are reported from isolated stations: Nikolaievsk, —3°.5; Vladivostock, normal and +0.02 inch; Pekin, +2°.5 and —0.03 inch; Zi Ka-Wei, normal and +0.02 inch; Yokohama, +1° and normal; Nagasaki, —5° and —0.07 inch: Yeniseisk. normal and normal; Barnaul, normal and —0.16 inch; Tashkend, +4°.5 and —0.23 inch; Biskra, +1° and —0.08 inch; Fao, compared with 1877 only, +16° and +0.10 inch; Free Town, +1° and —0.01 inch; Mauritius, normal and —0.02 inch; Fort Napier, —2° and —0.09 inch; Cape Town, normal and —0.04 inch; Angra, +1°.5 and —0.05 inch; Ponta Delgado, normal and —0.06 inch; Funchal, —1°.5 and +0.04 inch; Paramaribo, normal and normal; Bridgetown, normal and —0.02 inch; St. Thomas, —1° and +0.02 inch; Navassa, +2°.5 and normal; Medellin, —3°.5; San José de Costa Rica, —2°; Mexico, —1°.5 and 0.08 inch; Melbourne, +1° and —0.02 inch; Hobart Town, —8°.5 and +0.05 inch; Archangel, —5°.5 and —0.14 inch; Stykkisholm, normal and +0.02 inch; Godthaab, —2°.5 and +0.02 inch; York Factory, +6°.5 and +0.07 inch; Fort St. Michael's, —7° and +0.03 inch.

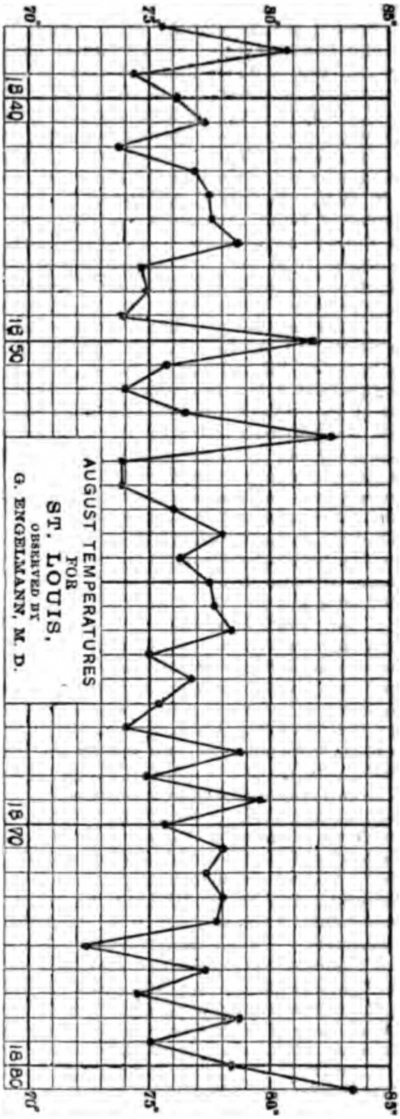
Chart No. VI.—This chart displays the tracings of the probable courses of twenty-one of the principal storm areas of the Northern Hemisphere for the month of September, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from the logs of vessels of the merchant marine of the North Atlantic Ocean. In connection with a study of the tracks of the centers of the areas of low barometer, attention should be directed to the unusual number of storms passing north of the British Isles and terminating on the northern coast of Russia; also the small number traversing Russia and Siberia. By an examination of the chart it will be seen that no area of barometric minima appeared over either eastern Europe or Asia after the disappearance of No. II on the 9th. From the 1st to the 7th the range of pressure over Russia and Siberia was comprised between the readings 28.88 and 30.11. On the 8th, as area No. II appeared central in the valley of the Obi, the barometer rose from 0.10 to 0.25 inch over Russia. To trace the incipient stages of this advent of high pressure it will be necessary to return to the relative distribution of presare as indicated upon the daily charts for the 1st. Upon an examination it will be found that an area of 30.40 covered the central portion of western Europe and extended thence westward over the ocean to the meridian of 20° W. This area remained stationary during the 2d, but by the morning of the 3d was reduced to 30.20, and extended southward to the Mediterranean. On the 4th the central area was reduced to 30.10, and covered the region of the Black Sea; 5th, pressure reduced to 30.00, position stationary. 6th, moved eastward over Toorkistan, no change in barometer; 7th, position of center remained unchanged, pressure rose to 30.20; a second area (30.10) appeared over western Russia, and between these two areas of high the barometer ranged from 29.71 to 29.92; 8th, areas of high combined over central Russia with a maximum pressure of 30.28 at Moscow. From the 9th to the 30th the pressure at the center of high ranged between 30.23 and 30.60, and for the most part the position of this area was confined to central and eastern Russia, occasionally reaching eastward to Yeniseisk. The maximum pressures on the successive dates following this advent of high pressure are given as follows: 9th, 30.23; 10th, 30.25; 11th, 30.39; 12th, 30.37; 13th, 30.34; 14th, 30.36; 15th, 30.39; 16th, 30.34; 17th, 30.34; 18th, 30.41; 19th, 30.47; 20th, 30.33; 21st, 30.32; 22d, 30.29; 23d, 30.35; 24th, 30.46; 25th, 30.58; 26th, 30.60; 27th, 30.54; 28th, 30.52; 29th, 30.50; 30th, 30.54. In view of these facts regarding the position and degree of the areas of high, the relative movement of the areas of low pressure become more clearly defined. So prolonged and excessive was the barometric maxima of northern Russia and western Siberia that the passage of the centres of barometric minima beyond the 40th meridian E. was rendered impossible. The general distribution of storm-paths is given as follows: Five, Nos. I, VII, IX, X and XV, were confined throughout their paths to the United States and Canada. Two, Nos. XVI and XX, formed over the northwestern portion of the United States, and moving thence eastward to the Canadian maritime provinces, passed over the ocean to the western coast of Europe. One, No. XIII, of cyclonic origin, formed over the Caribbean Sea, pursuing thereafter the characteristic northwesterly course to the Gulf of Mexico, whence it curved eastward, crossing northern Florida and moving thence northeastward over the ocean. Seven, Nos. II, VI, XI, XIV, XVII, XVIII, and XXI, formed over the ocean between 35° and 55° N., pursuing northeasterly paths, in most cases passing north of the British Isles. Two, Nos. III and IV, formed over southern Scandinavia and western Siberia, respectively, moving thereafter in easterly courses. Four, Nos. V, VIII, XII, and XIX, first appeared over southern China and the China Sea, and, moving in northeasterly courses to the north and south of the Japan islands, disappeared over the Pacific Ocean. Concerning the storms of North America: No. I.—This storm appeared to result from the disturbing effects of area No. XIII, described in the July, 1881, Review. The pressure over the Gulf of Mexico recovered very slowly after the passage of the latter storm, and before reaching the normal a rapid decline began on the 27th of August, continuing throughout the month, the area taking definite form on the 1st of September. During this day it left the northern Gulf coast accompanied by heavy rains and very low pressures. On the 2d and 3d, passed northeastward over Tennessee, the Ohio Valley, and the Lower Lake regions, accompanied by heavy rains and followed by rapidly rising pressures. On the 4th and 5th, moved northeastward over Canada, disappearing thence over the British Possessions. This storm caused great destruction of property, principally vessels, along the Gulf coast from Pensacola to New Orleans, the loss, as estimated, reaching between $200,000 and $300,000. On Lakes Huron and Erie considerable damage to vessels occurred. No. VII.—While area No. 1 was moving over Canada the pressure fell to the westward in Manitoba, and on the morning of the 5th an area of 29.80 prevailed over the entire region north of the Lakes and south of Hudson's Bay. On the 6th the area of 29.80, considerably circumscribed, was confined to the Lake Superior region; lowest barometer at Duluth, 29.72. 7th, central over Canada, but with diminished energy, disappearing on the following day to the northward. No. IX.—This area first appeared, as a slight depression, over western Nebraska, on the morning of the 6th, and during this day and the following passed eastward to Lake Michigan, accompanied by light local rains, occasionally heavy. On the morning of the 8th the depression was central over the northern portions of Vermont and New Hampshire; barometer at Burlington, 0.31 inch below the normal. On the 9th central in New Brunswick, with considerably diminished energy, and passing thence eastward over the Gulf of Saint Lawrence during the day, disappeared off the eastern coast of Newfoundland on the 10th. No. X.—This area entered the Pacific coast of North America between the parallels of 40° and 50° N. during the 7th, on which day the pressure was generally 0.20 inch below the normal throughout Oregon and Washington Territory. From the 8th to the 12th the depression pursued an irregular easterly path, reaching Lake Michigan on the morning of the latter date. Very light and extremely local precipitation attended the course of the area thus far, although the barometer was from 0.21 to 0.27 inch below the normal. After crossing the northern portion of Michigan and the Province of Ontario the area disappeared on the 13th over the territory southeast of Hudson's Bay. No. XV.—During the presence of No. X over western Canada area No. XV formed as a secondary depression in rear of the latter over the Ohio Valley. High winds and stormy weather were experienced over Lake Erie on the night of the 13th, continuing on the 14th, with heavy rains and occasional thunder-storms. On the morning of the 15th the depression was central in northern New Brunswick, accompanied by brisk to high winds and local rains over the Canadian maritime provinces. During the day disappeared northeastward beyond the Gulf of Saint Lawrence. No. XVI.—On the morning of the 14th an area of 30.20 prevailed over the eastern portion of the Lower Missouri and throughout the Upper Mississippi Valleys. On either side of this high area obtained an area of low (No. XV.—central over Lake Erie, and No. XVI, central in northern Montana). Moving eastward the latter depression was central over Lake Superior on the 15th, and during the two following days passed over the Province of Ontario and down the Saint Lawrence Valley, reaching the coast of Labrador by the 18th. Attending the movement of the area over the course as above indicated, light rains with occasional thunder-storms began after leaving Dakota, and over Lake Superior considerable changes in pressure occurred, the barometer reading from 0.30 to 0.33 inch below the normal. On the morning of the 18th the barometer at Quebec was 0.51 inch below the normal, and brisk to high winds with local rains prevailed in the lower Saint Lawrence Valley. On the morning of the 19th the depression appeared to be central south of Greenland; barometer at Godhaab, 29.55, a fall of 0.70 inch in past forty-eight hours; wind shifted from ESE. to NNE.; 20th, barometer at Gothaab rose to 29.85, wind still NNE. So far as indicated upon our charts the disposition of the central area of atmospheric disturbance is somewhat uncertain, owing to the rapid advance of a high area from Newfoundland, and the lack of sufficient reports to define the location. On the 22d, however, the depression appeared clearly determined by the following barometric readings and wind directions: In 44° 30′ N., 17° W., 29.34 E., gale, heavy rain; in 49° 20′ N., 23° W., 29.65 SW., brisk, heavy rain; in 51° 34′ N., 15° 06′ W., SW., strong gale, heavy squalls, high sea; in 50° 13′ N., 12° 36′ W., wind rapidly rising, strong westerly swell. During the day, as the storm passed northeastward along the western coast of the British Isles, very violent southwest to southeast gales were experienced. On the north coast of Ireland, three miles northwest of Irishtrahull Light, ship Spartan experienced cyclone from SW. to SSE., and then to WNW.; barometer 28.43, lost entire suit of sails. Over the British Isles on this day the barometer was generally above 29.85 (lowest, 29.53 at North Unst), with southwest to northwest winds and cloudy or partly cloudy weather; 23d central northwest of Scotland; Monach Light-house, 28.60 W., force 8; Nairn, 28.82 SSW., force 7; North Unst, 28.88 SE., force 8; Thorshavn, 28.76 NE., force 7; Sandwick Manse, 28.70 S., 44 miles per hour; Aberdeen, 29.06 SW., 33 miles; in 55° 15′ N. 9° 20′ W., 29.19 W., force, 6; in 49° 45′ N., 17° 45′ W., 29.47 W., force 6; in 51° 30′ N., 19° 58′ W., SW. and NW. strong gales, heavy squalls, and high seas; in 50° 33′ N., 21° 17′ W., heavy NW. squalls, high confused sea. The following report will in a measure indicate the extent of the depression to the southwestward, and the violence with which the atmospheric equlibrium was being restored: in 47° N. 22° 30′ W., barometer about 29.70, violent gale from the NW. lasting forty-eight hours. Over the British Isles south of the 46th parallel the winds were still southwest to northwest, but with increased energy, while the pressure fell from 0.20 to 0.60 inch in the past twentyfour hours. 24th, over the British Isles the winds at southern stations shifted to the north, while at northern stations they remained west and southwest with diminished force; the barometer rose rapidly with a variation of from 0.03 to 0.85 inch in past twenty-four hours. Over the ocean from 48° to 52° N., and between 7° and 27° W., heavy W. and NW. gales, with fierce squalls and high seas prevailed. 25th, central over the northern portion of Scandinavia; Tromso, 29.38 N., rain; Bergen, 29.80 SSW., rain; Brono, 29.68 SW.; along the western shores of the Baltic Sea and the Gulf of Bothnia, the barometer ranged from 30.04 at Stockholm to 29.68 at Haparanda, with southwest winds, force 6 to 7. 26th, probably central north of North Cape, where during the day it disappeared to the eastward; Tromso, 29.72, SSW.; Haparanda, 30.03, S. No. XX.—This storm developed from an area of low pressure central in northwestern Montana on the morning of the 20th. During this day and the following the depression passed rapidly eastward to Lake Superior, where it was central on the morning of the 22d, followed by rapidly rising pressure (from 0.20 to 0.30 inch above the normal). The area crossed the Canadian and maritime provinces during the 23d and 24th, accompanied by light rains and a fall in pressure of from 0.20 to 0.36 inch in twenty-four hours. Morning of the 25th, probably central north of Newfoundland: barometer at Saint John's 29.77, wind SW., a fall of 0.23 inch in the past twenty-four hours. 26th, the depression passed rapidly northeastward to near the 60th parallel; Godthaab, 29.07, NNE., a fall of 0.50 inch in past twenty-four hours; Stykkisholm, 29.65, E., a rise of 0.19 inch in past twenty-four hours. 27th, central southeast of Iceland, near the 30th meridian; Godthaab, 29.38, ENE.; Stykkisholm, 28.82, S., a fall of 0.83 inch in past twenty-four hours. 28th central off the northwestern coast of Iceland; Stykkisholm, 28.71, SW.; Godthaab, 29.53, NW.; Thorshavn, 29.54, SW., a fall of 0.22 inch in past forty-eight hours; wind shifted from NW. to S. and SW. 29th, Stykkisholm, 29.10, SE.; 30th, 29.06, SE. On the 29th the central area appeared to remain about stationary off the northeastern coast of Iceland, disappearing very slowly on the 30th in a high pressure area to the north of Scandinavia. No. XIII.—This storm developed over the Caribbean Sea under much the same conditions that preceded the origin of No. X (August, 1879), of the July, 1881, Review. During the night of the 11th there was a general but slight fall in the barometer at all West India stations south of parallel 20° N, supplemented by two similarly conditioned reports from United States steamer Vandalia, in 9° 50′ N., 79° 55′ W., and from ship Iron Cross, in 16° 46′ N., 68° 31′ W. 13th, Vandalia at Aspinwall, barometer 29.82, SW., no change in the past twenty-four hours; Kingston, Jamaica, 30.15, NE., a fall of 0.05 inch in past twenty-four hours; Navassa, 29.82, E., a fall of 0.05 inch in past twenty-four hours. Ship Iron Cross, in 17° 20′ N., 71° W., 29.98, ENE., force 5; on the 12th, in 16° 46′ N., 68° 31′ W., 30.02, E., force 3; St. Thomas, 29.62, E., a fall of 0.03 inch in past twenty-four hours. During the 14th, 15th, and 16th the barometer at the above-named stations, except St. Thomas, remained about stationary, winds steady from the east and northeast. It is safe to presume, knowing the narrow diameter possessed at times by this class of storms, that the stations from which reports have already been given were situated without the influence of the central area of disturbance, and therefore the passage of the depression would not be indicated in all cases by a change in pressure or wind direction. During the first two days of development the area was probably much less circumscribed, and therefore a general fall in the barometer, as before noted. On the 17th, at stations in Cuba and southern Florida, the barometer fell from 0.02 to 0.06 inch, with winds shifting from south to northeast. On this day and the following, vessels reported heavy storms north and east of the Yucatan Peninsula. On the morning of the 19th, as the depression lay to the eastward, the barometer at Havana read 29.88, wind S.; Key West, 29.92, SE.; Punta Rassa, 29.94, NE.; along the northern Gulf coast the pressure ranged from 30.00 to 30.09, winds north and northeast, which directions had been constant since the 3d. During this period of seventeen days the pressure over the Gulf States ranged from 30.03 to 30.25. 20th, in 20° 10′ N., 84° W., wind S., force 5, misty; in 20° 25′ N., 85° 40′ W., 29.84 SSE., light rain; Havana, 29.88 SE., fair; Key West, 29.90 S., cloudy, 1.74 inches of rain in past twenty-four hours; Punta Rassa, 29.89 E., cloudy, 0.48 inch of rain in past twenty-four hours; along the northern Gulf coast, east of Galveston, the barometer had fallen from 0.07 to 0.26 inch in the past twenty-four hours, winds NE., accompanied by light rains. 21st, in 22° N., 85° 35′ W., 29.85 SSE., force 6; in 23° 20′ N., 87° 30′ W., 29.84 SW., gale; Havana, 29.90, SSE., light, fair; Key West, 29.90 S., light, fair; Punta Rassa, 29.87, SE., brisk, cloudy; on this day rain became general along the South Atlantic and Eastern Gulf coasts, with brisk to high north and northeast winds. By morning of the 22d the barometer had risen from 0.05 to 0.15 inch, at all stations in the Eastern Gulf, the depression having crossed northern Florida during the night and was now central off the South Atlantic coast in the form of an elongated area, extending northeast and southwest; in 40° 39′ N., 67° 30′ W., NE. and ENE. storm, high seas and heavy rain. 30 miles off Cape Hatteras, violent gale from N., heavy cross-seas, schooner White Wing foundered. Light rains with north and northeast winds, and the barometer generally above 30.05, prevailed along the South and Middle Atlantic coasts. 23d, in 41° N., 66° W., 29.82 NE., violent gale, heavy rain; in 40° N., 58° W., 29.96 ENE., violent gale, gloomy weather, drizzling rain; in 40° 32′ N., 58° 47′ W., 29.94 SE., violent gale, heavy rain. 24th, depression moving northeastward in about 40° N., 60° W.; in 41° 37′ N., 55° 38′ W., 29.79 NNE., threatening; in 42° 18′ N., 57° 12′ W., 29.93 NE., heavy gale, light rain; in 41° 37′ N., 54° 04′ W., 29.83 NNE., foggy; in 41° N., 55° W., 29.82, SW., violent gale, heavy rain. 25th, central depression inclosed by the isobar of 29.80, which extended northward to Greenland, thus in a measure combining with area No. XX, then central northeast of Newfoundland, its centre inclosed within the isobar of 29.60. 26th, depression rapidly filled up, disappearing between two areas of high pressure (30.40), one covering the Middle Atlantic and New England coasts and extending thence eastward to the 40th meridian, and the other embracing the Azores. Of the storms forming over the North Atlantic Ocean and passing thence eastward to the mainland of Europe, the following descriptions are given: No. II.—This storm appeared to form as a secondary depression to No. XVI of July, 1881, Review; in 53° N., 30° 20′ W., 29.63, SW., hurricane, heavy rain; in 52° N., 34° W., 29.67, S., violent gale; in 49° N., 36° W., 29.71, SSW., hurricane, heavy rain; in 43° N., 55° W., 29.71 NNE., violent gale, thunder-storm. During the day the depression moved rapidly northeastward, and was, on the morning of the 2d, central east of Iceland; Thorshavn, 29.30, W., brisk, a fall of 0.61 inch in past twenty-four hours; over the British Isles the winds were southwest and south, and from brisk to high; light rains prevailed, with the pressure over Scotland generally below 29.70. 3d, central north of Scandinavia; Tromso, 29.04, SE.; Haparanda, 29.34, SE.; Brono, 29.45, W. 4th, depression passed southeastward over northern Scandinavia; Tromso, 28.92, NNE.; Brono, 28.99, W., gale, rain. Haparanda, 28.83, E., brisk, rain; north of parallel 60° and between the meridians of 10° and 40° E., the pressure at all stations fell below 29.40, winds SE. to SW. and NW. 5th, depression central north of the White Sea; Archangel, 28.88, SW. high, and a fall of 0.61 inch, in past twenty-four hours; over central and northern Russia the pressure fell from 0.15 to 0.25 inch, with winds shifting to south and southeast. 6th, central in northeastern Russia; Archangel, 29.30, NW.; Ekaterinburg, 29.35, WSW.; Barnaul 29.56, SE.; Kasan, 29.50, WSW.; Yeniseisk, 29.81, ESE. 7th, central in the valley of the Obi, course southeastward; Ekaterinburg, 29.49, W.; Barnaul, 29.78, SW.; Yeniseisk, 29.77, ESE. 8th, course changed more to the east, barometer at Barnaul remained stationary, while at Yeniseisk there was a rise of 0.10 inch. 9th, barometer at Barnaul fell 0.09 inch, and at Yeniseisk, 0.04 inch, winds shifted toward NW. No. VI.—On the 4th and 5th the barometer fell quite rapidly in the vicinity of 50° N., 30° W., forming an area of 29.80, which on the 6th embraced the whole of the British Isles, western Germany, and northern France; lowest pressures at Monach Light-house, 29.49, and at Galway, 29.48; cloudy or rainy weather prevailed over the British Isles. 7th, depression still central off the Irish coast; Galway, 29.23, WNW.; Armagh, 29.26, SE.; the area of 29.60 covered the British Isles, over which cloudy or rainy weather prevailed. 8th, depression about stationary; Galway, 29.10, W.; Armagh, 29.20, S.; Monach Light-house, 29.22, SSE.; during this day the depression crossed the British Isles, and on the morning of the 9th was central over the White Sea; the barometer rose rapidly at all stations, from 0.10 to 0.70 inch, with winds shifting to north and northwest; during the day depression passed northeastward over southern Scandinavia, and on the morning of the 10th was central over the Gulf of Bothnia; Umea, 29.42, N., 2.39 inches of rain in past twenty-four hours; Hernosand, 29.42, NNW.; Stockholm, 29.43, WNW., rain; Upsala, 29.39, W., rain. 11th, central, with much diminished energy, over northern Finland, and on the 12th disappeared north of the White Sea. No. XI.—A very sudden fall of the barometer during the night of the 7th revealed on the following morning an area of 29.40, in the vicinity of 44° N., 50° W.; in 45° N., 45° 30′ W., 29.37, SE.; in 43° N., 47° W., 29.58, NNW., hurricane, heavy rain. 9th, central near 50° N., 45° W.; in 48° N., 40° W., 29.62, NE., overcast and rain. During the 10th and 11th central between the parallels of 50° and 60° N., inclosed by the isobar of 29.80. On the morning of the 12th central northwest of the Hebrides; Monach Light-house, 29.14, WSW.; Sandwick Manse, 29.25, SSW.; North Unst, 29.22, S.; Thorshavn, 29.19, SSE.; pressure over the British Isles and Norway below 29.60, with cloudy or rainy weather and south and southwest winds. 13th, central north of the Shetland Isles; Thorshavn, 29.43, W., force 2; North Unst, 29.35, W., force 6; pressure rose slightly along the Norway coast. During the 14th remained about stationary, center slowly filling up, but on the 15th the barometer at Tromso indicated renewed energy in the central depression by a fall of 0.23 inch in the past twenty-four hours. 16th, passed eastward to northern Lapland, followed over northern Scandinavia by a rise of 0.15 to 0.25 inch, with winds shifting to west and northwest; during the day disappeared to the eastward in a high pressure prevailing over eastern Russia and western Siberia. No. XIV.—During the 11th and 12th as area No. XI passed northwest of the British Isles, the pressure over northern Spain and the Bay of Biscay fell from 0.10 to 0.20 inch. This rapid change in the barometer was followed on the morning of the 13th by the development of an area of 29.60 over the Bay of Biscay, accompanied by southwest winds and light rains over Spain, and southeast to northeast winds with occasional rains along the western coast of France and the southern coasts of the British Isles. During the day the center of depression passed rapidly northeastward over the English Channel and southern England to the North Sea, where, on the morning of the 14th, the depression was central off the southwestern coast of Norway. This movement to the northeast was followed over Spain, western France, and the southern portion of the British Isles by rapidly rising pressure, northwesterly winds, and clearing weather, except over the first-named district, where light to heavy rains still continued. 14th, Vestervig, 29.52, S., rain; Bergen, 29.69, NNW., fair; Christiania, 29.58, calm, cloudy; during the day the central depression merged with area No. XI, then covering the northern portion of Norway. No. XVII.—During the disappearance of areas No. XI and XIV over northern Europe, and before complete restoration of the atmospheric equilibrium north and west of the British Isles, a rapid decline in the pressure to the south of Iceland was reported. On the morning of the 17th the isobar of 29.80 covered Iceland and the ocean southeastward to the Hebrides and Shetland Islands, and eastward to the meridian of Greenwich; in 61° N., 17° W., 29.64, SW., violent gale, gloomy weather, and rain. 18th and 19th, depression remained about stationary in the vicinity of the Faroe Islands, with a tendency to fill up, the barometer at Thorshavn having risen 0.19 inch in the twenty-four hours ending the morning of the 19th. 20th, depression moving slowly northeastward; very decided change during the past twenty-four hours, the barometer at Thorshavn having fallen 0.68 inch; at North Unst, 0.40 inch; at Sandwick Manse, 0.54 inch, and at Bergen 0.22 inch, the winds shifting to the southwest, with cloudy and rainy weather. 21st, central on the southwestern coast of Norway; Brono, 29.44, calm; Bergen, 29.57, W., rain; North Unst, 29.55, SW.; during the day the depression passed eastward across northern Scandinavia, disappearing in an area of high pressure then prevailing over western Russia. No. XVIII.—As the winds shifted to the southeast and southwest over northern Spain during the night of the 15th, the pressure fell from 0.09 to 0.17 inch at coast stations, and an area of 29.80 probably formed over the Bay of Biscay. Along the western coast of France and the southern coast of England the winds shifted to northeast, with slowly falling barometer at stations along the former coast, and slowly rising barometer at stations along the latter. The depression as yet had taken no decided form, so far as indicated on the daily charts, but on the morning of the 17th the isobar of 29.80 inclosed the central area, covering the ocean to the west of Portugal; Lisbon, 29.81, SSW., a fall of 0.21 inch in past twenty-four hours; Santiago, 29.79, SE., a fall of 0.05 inch. 18th, Santiago, 29.78, NE.; Lisbon, 29.87, E. During the day the depression disappeared in an area of high barometer (30.20) then prevailing over Western Europe. No. XXI.—This storm developed as a secondary depression to area No. XX, the latter being central east of Iceland on the 30th, inducing, through an extension of its elongated area of barometric minima, a fall in twenty-four hours of 0.20 to 0.30 inch in the vicinity of 50° N., 20° W. On the morning of the 30th lowest pressures as follows: In 52° N., 27° W., 29.65 W., force 9, gloomy, rainy weather; in 52° N., 22° W., 29.71 NW., violent gale; in 49° N., 25° W., 29.81, WNW., force 7, rain; in 49° 30′ N., 16° 20′ W., 29.77, S., cloudy. The further course of this area will probably appear on Chart No. VI, for October, 1879. Of the storms confined to Russia and Siberia, No. III appeared over the Gulf of Bothnia on the 1st, probably as a result of the easterly movement of area No. XVI of the August, 1879, chart, which, on the 31st of that month, was central northeast of Iceland. On the morning of the 2d the depression was central just south of the White Sea, inclosed by the isobar of 29.60; Archangel, 29.69, NE., rain, a fall of 0.28 inch in past twenty-four hours; Kasan, 29.87, SE., a fall of 0.11 inch; Moscow, 29.92, SSE., a fall of 0.23 inch; St. Petersburg, 29.71, WNW., a fall of 0.21 inch. 3d, depression much contracted in size moved eastward to near the western line of Siberia; Archangel, 29.40, NNW.; Kasan, 29.75, WSW.; Ekaterinburg, 29.73, WSW.; during the day disappeared over Western Siberia partly through the influence of a high-pressure area to the eastward and low area No. II, then covering Northern Scandinavia and Lapland. No. IV.—Coincident with the appearance of No. III over the Gulf of Bothnia, the distribution of pressure at surrounding stations indicated the presence of an area of low in the valley of the Obi south of the 60th parallel. The position of this depression taken in connection with the course of No. XV of the August, 1879, chart, shows that the former is very probably a continuation of the latter. On the morning of the 1st the position of No. IV was indicated by the isobar of 29.60, inclosing portions of the provinces of Tobolsk, Omsk, and Tomsk; Barnaul, 29.68, S., a fall of 0.30 inch in past twenty-four hours; Ekaterinburg, 29.79, NNW., a rise of 0.35 inch in past twenty-four hours; Yeniseisk, 29.89 E., cloudy, a fall of 0.24 inch in past twenty-four hours. 2d, depression central over the western portion of the province of Tomsk and the southern portion of Yeniseisk; Barnaul, 29.69, SW.; Yeniseisk, 29.67, ENE., thunder-storm. 3d, central over the province of Irkoutsk; Barnaul, 30.04, NW., cloudy; Yeniseisk, 29.88, W., rain. The further course of this area cannot be traced, owing to the lack of reports from Eastern Siberia. Of the storms leaving the Asiatic coast, No. V first appeared on the 2d over southeastern China, and moved thence during the day east-northeast to the Yellow Sea, where, on the following morning, it was probably central. 3d, Nagasaki, 29.66, S., a fall of 0.10 inch in past twenty-four hours; Zi-Ka-Wei, 29.73, NE., rain. 4th, central over the Japan Sea; at all coast stations winds shifted to north and northwest with rapidly rising pressure; at Yokohama the wind continued SE., with a fall of 0.16 inch; at Nagasaki and Wakayama, in rear of the storm, the winds shifted to NE., with a rise of 0.11 inch at the former and a fall of 0.07 inch at the latter station. 5th, central east of Yesso, disappearing during the day in a high pressure (30.20) southwest of Kamtchatka. No. VIII.—This depression first appeared over Southern China on the 5th; Hong-Kong, 29.77, calm, a fall of 0.06 inch in past twenty-four hours; Zi-Ka-Wei, 29.96, wind shifted to NE., with a rise of 0.06 inch. 6th, central southwest of Formosa; Manilla, Philippine Islands, 29.78, E., a fall of 0.06 inch in past twenty-four hours; no change at Hong-Kong. During the 7th, 8th, and 9th the depression passed slowly northeastward over the ocean south of the Japan Islands. The changes of pressure at coast stations were comparatively unimportant until the morning of the 9th, when the barometer at Wakayama indicated a fall of 0.14 inch in past twenty-four hours; at Nagasaki, 0.18 inch; Yokohama, 0.28 inch; winds shifted to north and northeast, with heavy rains except at Nagasaki; 10th, disappeared northeastward near 150° E., followed on the 11th by a rise of 0.10 to 0.13

inch at Wakayama and Yokohama. No. XII.—This storm developed over the China Sea on the 10th and 11th. On the morning of the latter date the barometer in 22° 19′ N., 115° E., showed a fall of 0.17 inch in past twenty-four hours, heavy rain, wind ENE., force 5; Manilla, 29.80, S.; 12th, depression central near 20° N., 130° E., with an elongated area of barometric minima (29.60) running from near the Philippine Islands northeastward to 145° E.; rain, with northeast gales, were reported from Yokohama, the former condition continuing since the 10th. 13th, depression central, with area of disturbance more circumscribed, in 33° N., 140° E.; Yokohama, 29.42, N., a fall of 0.48 inch in past twenty-four hours; Tokei, 29.54 N., heavy rain, a fall of 0.40 inch in past twenty-four hours; Wakayama, 29.65, NNW., a fall of 0.21 inch in past twenty-four hours. 14th, depression moved northeastward to near the 40th parallel, followed over the eastern portion of Japan by clearing weather and a rise in the barometer of from 0.20 to 0.33 inch; winds still north and northeast. No. XIX.—On the 19th an area of 29.80 covered the China Sea and Pacific Ocean in the vicinity of the islands of Formosa and Luzon; Manilla, 29.73, WNW. 20th, Manilla, 29.70, WNW.; Macao, 29.80, NW.; in 26° 17′ N., 121° 27′ E., 29.50, E., force 6, heavy rain, very rough sea; Zi-Ka-Wei, 29.93, NNE., cloudy. 21st and 22d remained about stationary southwest of the Japan Islands, barometer slowly falling at all stations, accompanied by northeast winds and occasionally heavy rains. 23d, depression moved rapidly eastward to near 144° E., followed at all Japanese stations by rising pressure and clearing weather; in 36° 59′ N., 150° 47′ E., 29.77 NNE., force 5, cloudy weather; the remainder of the storm's course as charted depends upon the reports of the steamship Belgic, of the Occidental and Oriental Steamship Company, during a portion of her voyage from Yokohama to San Francisco. 24th, in 37° 50′ N., 156° 26′ E., 29.83, N., force 5, cloudy. 25th, in 39° 03′ N., 161° 54′ W., 29.86 NNE., force 4, cloudy. 26th, in 40° 08′ N., 167° 03′ W., 29.83, ENE., force 4, squally. 27th, in 41° 07′ N., 171° 38′ W., 29.61, E., force 6, heavy rain and violent squalls. 28th, 42° 04′ N., 176° 21′ W., 29.54, S., force 5, cloudy weather, heavy sea. 29th, in 43° 05′ N., 177° 37′ W., 29.61 WSW., force 5, cloudy, moderate sea. 30th, in 43° 32′ N., 171° 13′ W., 29.75, NNW., force 6, heavy squalls. On the following day the ship encountered an area of high pressure (30.10), with clearing weather and winds shifting to west and northwest.

TEMPERATURE OF THE AIR.

The mean temperature of the air for August, 1881, is shown by the isothermal lines (in red) on Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month and the departures of such means from the average for many years. In all districts east of the 100th meridian, except the Florida peninsula, which is normal, the temperature is everywhere above the average, the excess being most marked over that portion of the country lying between the 87th and 97th meridians, where the departure ranges from +2°.5 to +3°.6. This region of high mean temperature very nearly coincides with that over which the excessive and dangerous heat of the month occurred. West of the 100th meridian the mean temperature is below the average in every district, except the Southern Pacific Coast region, which is normal. At Salt Lake City and Pike's Peak the temperature is above the average, the former 1°.4 and the latter 2°.1. The region of greatest deficiency (—3°.1 to —5°.6) covers that portion of the country north of the 40th parallel and west of the 110th meridian.

Ranges of temperature at signal service stations.—Monthly ranges in general varied from 30° to 45° over the country east of the Rocky Mountains, and from40° to 55° to the westward of that region. The smallest ranges were: San Francisco, 18°; Galveston, Port Eads, and New Orleans, 20°; Punta Rassa and Key West, 21°; Indianola, 22°; Fort Macon, N. C., and Pensacola, 24°; Portsmouth, N. C., and San Diego, 25°; Jacksonville, 26°; Pike's Peak and Hatteras, 28°. The largest were: Fort Benton, 72°; Rock Creek, Mont., 71°; Fort Missoula, 67°; Winnemucca, 66°; Fort Sully, Dak., 65°; Fort Lapwai, 64°; Boisé City, 61½; Smithville, Dak., and Forts Custer and Shaw, 59°. The daily ranges varied in the different districts as follows: New England, 14° at New Shoreham and 17° at Wood's Holl and Mount Washington to 30° at Boston; Middle Atlantic States, 15° at Cape May to 30° at New York, Philadelphia, and Washington; South Atlantic States, 15° at Macon and 16° at Smithville, N. C., to 23° at Kittyhawk, Charlotte and Atlanta, and 24° at Augusta; Eastern Gulf States, 19° at New Orleans to 24° at Pensacola and 25° at Vicksburg; Western Gulf States, 17° at Port Eads and 18° at Indianola to 31° at Shreveport and 33° at Fort Gibson; Rio Grande Valley, 24° at Brownsville to 32° at Castroville, Uvalde, and Laredo; Ohio Valley and Tennessee, 25° at Memphis to 33° at Pittsburgh and 35° at Morgantown; Lower Lake region, 22° at Erie to 31° at Detroit and 33° at Cleveland; Upper Lake region, 22° at Grand Haven to 29° at Marquette and Alpena, and 32° at Port Huron; Upper Mississippi Valley, 23° at La Crosse to 31° at Des Moines and 32° at Keokuk; Missouri Valley, 27° at Omaha and 28° at Huron to 35° at Leavenworth and 41° at Fort Bennett; extreme Northwest, 32° at Moorhead to 42° at Bismarck and Saint Vincent and 50° at Fort Buford; Northern slope, 32° at Helena and 36° at North Platte to 53° at Fort Custer and 54° at Fort Assinniboine; Middle Slope, 21° on Pike's Peak to 31° at Dodge City and 33° at Fort Elliott; Southern Slope, 27° at Henrietta to 33° at Jacksborough and 38° at El Paso; Northern Plateau, 42° at Lewiston and Spokane Falls to 51° at Eagle Rock and 57° at Missoula; Middle Plateau, 34° at Salt Lake City and 35° at Pioche to 53° at Winnemucca; Southern Plateau, 28° at Santa Fé to 42° at La Mesilla and 44° at Prescott; North Pacific coast, 31° at Portland to 38° at Roseburg: Middle Pacific coast, 17° at San Francisco to 35° at Sacramento and 36° at Red Bluff; South Pacific coast, 18° at San Diego to 43° at Visalia and 59° at Campo.


AUGUST TEMPERATURES
FOR
ST. LOUIS,
OBSERVED BY
G. ENGELMANN, M. D.

Deviations from mean temperatures.—Connecticut: Southington, mean temperature about normal. *Illinois:* Riley, mean temperature 4°.4, about the average of the past twenty years; warmest occurred in 1867, mean 74°.4. *Iowa:* Clinton, mean temperature 3°.0 above the average. *Kansas:* Manhattan, warmest since 1874. *Maine:* Gardiner, mean temperature 0°.3 above the average of the past forty-five years. *Missouri:* Saint Louis, Missouri Weather Service reports mean temperature 1°.2 above the average of the past forty-five years; only twice in that period has the mean temperature of any month exceeded that of August, 1881, 83°.5, viz, in July, 1854, and July, 1860.

High temperatures.—This subject for the month of August, 1881, presents features of equal importance and interest with those of the past month of July. The territory embraced within the area of excessive heat is considerably enlarged to the eastward as compared with July, and, as usual, coincides with the region of greatest departure of the monthly mean from the average for many years. Those portions of the month within which the maximum rises obtained are confined between the 3d and 6th, and again between the 9th and 14th. During these periods the relative distribution of atmospheric pressure placed the barometric minima over the northern portions of the country, where their dilatory movement to eastward, as in areas No. II and III, Chart No. I, appeared to influence very sensibly the accompanying rise of the thermometer. The following data has been collected independent of the reports of regular Signal Service observers, and illustrates more nearly the excessive suffering of animal and vegetable life than the actual temperature of the air scientifically considered. *Arkansas:* Little Rock, 12th, 100° to 104°; several sunstrokes, one fatal. *Illinois:* Mattoon, 4th, from 2.30 to 5 p. m., 102° in the shade; 5th, 100°; 6th, 1 p. m., 190°; 9th, 103°, air as hot and withering as an India simoon. Sandwich, 4th, 103°. Fairbury, 4th, 106°. Danville, 4th, 108°. Pontiac, 4th, 101°. Bloomington, 4th, 102°; 5th, 100°; 12th, 103°. Lasalle, 4th, 106°. Chatsworth, 4th, 106°. Elgin, 5th, 98°; numerous sunstrokes; outdoor work generally suspended. Chicago, 5th, 4 sunstrokes, 2 fatal; 8th, deaths of the past week number 5,257, or at the rate of 50.52 per 1,000, as against the normal rate of 18 per 1,000; cause of abnormal increase, the accompaniment of intense heat. Champaign, 12th, 106°; scorching southerly winds. Charleston, 12th, 102°; large number of hogs died from excessive heat. Quincy, 12th, 108°, hottest in past fourteen years. Cairo, 12th, 103°.

Waukegan, 4th, 10.30 a. m., 89°; 12 m., 99°; 2.15 p. m., 101°.5; 5th, 9 a. m., 89°; 10.30 a. m., 94°; 40 laborers on the Northwestern Railroad compelled to stop work; several sunstrokes, none fatal. South Elgin, 5th, 107°; outdoor work entirely suspended. Plano, 5th, during past four days temperature ranged from 98° to 108°. Vandalia, 9th, 108°; a scorching southwest wind struck the town about 10 a. m., producing a remarkable effect on animal and vegetable life; nothing like it ever before experienced. 12th, 110° in the shade; hottest ever known in this section of the country. Carrollton, 12th, 108°; hottest ever experienced; business seriously interfered with and agricultural interests terribly depressed. Chester, 8th to 11th, 104°; 12th, 105°, business partially suspended. Fairfield, 12th, 106° to 110° in the shade. Urbana, 12th, 100° to 106°; parching southerly winds; 1 sunstroke. Springfield, 12th, 100° to 105°; 1 sunstroke. Sandoval, 9th, 105°. Bunker Hill, 9th, 106°. Salem, 9th, 3 p. m., 104°; vegetation withered under a hot, parching wind. *Indiana:* La Porte, 5th, 102°. Michigan City, 4th, 100°. South Bend, 5th, 104°. Fort Wayne, 5th, 103°; 2 fatal sunstrokes. La Fayette, 5th, 99°; 4 sunstrokes, 2 fatal. Indianapolis, 12th, 101°. Spencer, 9th, four separate thermometers in different parts of the city registered 106° in the shade for a period of five hours, from 10 a. m. to 3 p. m. A thermometer exposed to the direct rays of the sun, shining upon a metallic background, registered 150°; when shining upon the roof of a wood-shed, registered 140°. A kettle containing twenty gallons of water and standing fully exposed to the direct rays of the sun, rose from 60° to 100°, between 10 a. m. and 3 p. m. New Albany, 12th, 105°; hottest in past sixty years; all outdoor work suspended; great suffering in the rolling-mills, glass-works, and other factories. Saint Meinrad, 12th, 104°, hottest in past ten years. *Iowa:* Des Moines, 5th, 99°.5, highest ever recorded. McGregor, 4th, 105°. Burlington, 5th, 106°; during past four days ranged from 95° to 106°. Marshalltown, 5th, 98° to 104°; outdoor work entirely suspended. Logan, 11th, 103°, highest in past twenty-four years. *Kentucky.*—Louisville, 12th, 105°, highest ever recorded. Millersburg, 12th, during past four days temperature ranged from 90° to 110°. Paducah, 12th, 2 p. m., 108°. *Massachusetts.*—Boston, 5th, 97°; 2 fatal sunstrokes. *Michigan:* South Haven, 4th, 98°; Jackson, 5th, 102°. *Manitoba:* Winnepeg, 12th, 91°; during past fortnight the temperature ranged from 73° to 91°; record without parallel in the history of this country. *Missouri:* Saint Joseph, 4th, 100°; Saint Louis, 9th, 7 a. m., 82°; 8 a. m., 85°; 9 a. m., 89°; 10 a. m., 93°; 11 a. m., 96°; 12 m., 96°; 1 p. m., 100°; 2 p. m., 101°; 3 p. m., 103°; 4 p. m., 103°; 5 p. m., 100°; 6 p. m., 98°; 3 sunstrokes, 1 fatal; black-bulb thermometer registered a maximum of 149°.2. 12th, 106° in shade; several sunstrokes, none fatal; hottest in past forty-five years. Joplin, 12th, 105°; 1 sunstroke. Hannibal, 12th, 103°; 1 sunstroke; several horses died from excessive heat. *New Hampshire:* Hanover, 5th, 101° in the shade and 132° in the sun. Weirs, 5th, 101°. Manchester, 5th, 100° to 103°. Concord, 5th, 100°. *New Jersey:* Trenton, 5th, 100° in shade; work in mills suspended; several sunstrokes, most of them fatal. Long Branch, 5th, 2 p. m., 109°; 5 sunstrokes, none fatal; four horses died from overheating. Ocean Grove, 5th, 97°; two horses died from intense heat. Bordentown, 5th, 100°; 13th, 101°. *New York:* New York City, 5th, 39 sunstrokes, 6 fatal; 94° in shade; at points along the Hudson, south of Albany, 97° to 100°; 6th, 19 sunstrokes, none fatal. Brooklyn, 6th, 6 sunstrokes, 3 fatal. Poughkeepsie, 5th, 97°; several sunstrokes, none fatal. Troy, 5th, 100°; several sunstrokes, 2 fatal. *Ohio:* Cincinnati, 5th, 98°, 5 sunstrokes, 1 fatal. Cleveland, 12th, noon, 100° to 102°; 3 p. m., 100°; hottest ever experienced; 2 sunstrokes, none fatal. Canton, 12th, 103°; 1 sunstroke. Madison, 12th, 104°; all out-door work suspended. *Pennsylvania:* Philadelphia, 5th, 97°; 9 sunstrokes, 6 fatal. Milton, 31st, 115°; hottest ever known. *Tennessee:* Clarksville, 12th, 12 m., 103°; 2 p. m., 104°.5; hottest in the past thirty-three years. Ashwood, 12th, 106°; hottest ever known in this section; will long be remembered as the "memorable hot Friday." *Texas:* San Antonio, 16th, 3 fatal cases of sunstroke, first ever known at this place. *Vermont:* Bradford, 5th, 102°. Norwich, 5th, 101°. White River Junction, 5th, 5 a. m., 70°; 9 a. m., 85°; 2 p. m., 100°; 9 p. m., 90°. *Virginia:* Petersburg, 13th, 106°; hottest for many years. Richmond, 13th, 1.30 p. m., 106°; great suffering from intense heat. *Wisconsin:* Milwaukee, 5th, warmest day in the history of the city; several fatal sunstrokes. Racine, 4th, 102°; several sunstrokes; outdoor work suspended. La Crosse, 5th, 104°; 3 sunstrokes, none fatal. Watertown, 5th, 102°; 1 fatal sunstroke. Prairie du Chien, 5th, 103°; many laborers compelled to cease work; 2 fatal sunstrokes. Oconomowoc, 5th, 99°; 1 fatal sunstroke.

Frost.—Eagle Rock, Idaho, 31st, on ranches ten miles from station; Winnemucca, 27th, heavy, 28th, very severe; Deer Lodge, Mont., 27th; Pike's Peak, 20th, killing vegetation, 22d, 28th, 29th, 30th, 31st; Escanaba, 15th, light; Saint Vincent, 6th, first of season.

Ice.—Eagle Rock, Idaho, 31st, on ranches ten miles from station; Winnemucca, 28th, one-eighth inch thick.

Table of comparative maximum temperatures for the month of August.

State or Territory.	Maximum for August, 1881, Signal service.		Highest since Signal service stations were opened—3 to 10 years.			Highest from any other source.			
	Station.	Temp.	Station.	Year.	Temp.	Place.	Year.	Temp.	Length of record.
		°			°			°	*Years.*
Alabama	Montgomery	97	Montgomery	1874	103	Mount Vernon Arsenal	1860	104	31
Arizona	Florence	110	Yuma	1879	115	Fort Mojave	1875	119	21
			Stanwick	1877	115				
Arkansas	Little Rock	102	Little Rock	1879	96	Fort Smith	1860	102	41
California	Campo	102	Red Bluff and Visalia	1879	108	Fort Yuma	1879	117	31
Colorado	Denver	96	Denver	1878	105	Fort Lyon	1868	108	20
Connecticut	New Haven	90	New Haven	'73,'76	90	New Haven	1864	98	87
Dakota	Smithville	112	Fort Sully	1876	107	Fort Randall	1863	108	21
						Fort Lincoln	1876	110	11
Delaware	Delaware Breakwater	91	Delaware Breakwater	1880	86	Fort Delaware	1865	101	44
District of Columbia	Washington	101	Washington	1874	101	Washington	1838	101	48
Florida	Jacksonville	96	Jacksonville	1874	100	Fort Barrancas	1878	103	59
						Fort King	1833	106	10
Georgia	Augusta	100	Augusta	1878	105	Augusta Arsenal	1845	100	51
Idaho	Fort Lapwai	103	Boisé City	1879	103	Fort Boisé	1871	121	17
Illinois	Springfield	100	Springfield	1880	97	Rock Island Arsenal	1870	102	8
						Chicago	1868	102	48
Indiana	Indianapolis	101	Indianapolis	'73,'74	95	New Harmony	1868	99	21
Indian Territory	Fort Supply	107	Fort Gibson	1874	106	Fort Gibson	1834	116	53
Iowa	Des Moines	103	Keokuk	1880	100	Fort Madison	1870	103	21
						Muscatine	1861	101	42
Kansas	Leavenworth	105	Leavenworth	1874	107	Fort Riley	1860	108	25
						Fort Leavenworth	1860	105	50
Kentucky	Louisville	105	Louisville	1874	102	Newport Barracks	1870?	96	28
Louisiana	Shreveport	105	Shreveport	1875	104	Baton Rouge Barracks	'60,'77	102	55
Maine	Portland	89	Portland	1876	95	Brunswick	1808	98	52
						Gardiner	1841	94	44
Maryland	Baltimore	98	Baltimore	1874	97	Fort McHenry	1834	100	50
						Fort Washington	1853	100	38
Massachusetts	Boston	97	Boston	1873,'6,'80	96	Amherst	1864	98	44
						New Bedford	1818?	91	68
Michigan	Detroit	99	Marquette	1879	96	Marquette	1862	100	22
						Fort Brady	1854	96	58
Minnesota	Saint Paul	96	Breckinridge	1876	101	Fort Ridgeley	1861	102	11
						Fort Snelling	1838	97	61
Mississippi	Vicksburgh	99	Vicksburgh	1878	100	Columbus	1862	99	9
Missouri	Saint Louis	106	Saint Louis	'74,'80	101	Saint Louis	1834	108	48
						Jefferson Barracks	1860	102	36
Montana	Fort Benton	108	Fort Keogh	1880	100	Fort Ellis	1875	112	31

Table of comparative maximum temperatures for month of August—Continued.

State or Territory.	Maximum for August, 1881, Signal service.		Highest since Signal service stations were opened—3 to 10 years.			Highest from any other source.			
	Station.	Temp.	Station.	Year.	Temp.	Place.	Year.	Temp.	Length of record.
		°			°			°	
Nebraska	North Platte	101	Omaha	1874	105	Fort McPherson	1870	110	15
Nevada	Winnemucca	100	Winnemucca	'78,'79	100	Fort Halleck	1875	106	14
New Hampshire	Mount Washington	67	Mount Washington	1876	72	Portsmouth	1840	97	3
						Fort Constitution	1850	94	33
New Jersey	Sandy Hook	96	Barnegat	1874	95	South Orange	1876	98	7
						Newark	1877	95	35
New Mexico	La Mesilla	98	La Mesilla	1878	107	Fort Bascom	1870	108	6
New York	Oswego	97	Rochester	1874	96	Auburn	1861	110	33
						Lansingburgh	1845	104	20
North Carolina	Charlotte	101	Wilmington	1878	99	Fort Johnson	1876	101	56
Ohio	Cincinnati	101	Cincinnati	1874	97	Cincinnati	1868	100	45
Oregon	Umatilla	99	Umatilla	1879	104	Fort Dalles	1853	104	16
Pennsylvania	Pittsburgh	100	Pittsburgh	1880	98	Mount Joy	1869	105	9
						Philadelphia	1881	98	123
Rhode Island	Newport	85	Newport	'76,'79	87	Providence	1866	95	35
South Carolina	Charleston	98	Charleston	'76,'78	97	Charleston	1752	96	104
						Aiken	1878	98	7
Tennessee	Nashville	103	Nashville	1874	104	Humboldt	'70,'71	104	4
Texas	Eagle Pass	108	Rio Grande	1876	108	Fort Clark	1871	113	25
						San Antonio	1871	109	32
Utah	Salt Lake City	100	Salt Lake City	1875	101	Mount Carmel	1877	106	7
						Fort Douglas	1871	105	19
Vermont	Burlington	94	Burlington	1876	97	Lunenburgh	1864	100	19
Virginia	Lynchburgh	100	Lynchburgh	1879	96	Alexandria	1863	104	11
						Fortress Monroe	1881	99	55
Washington Territory	Almota	99	Dayton	1880	93	Fort Walla Walla	'59,'60	107	12
West Virginia	Morgantown	92	Morgantown	1874	92	Weston	1876	93	3
Wisconsin	La Crosse	96	Milwaukee	1874	98	Fort Howard	'23-'26	100	30
Wyoming	Cheyenne	95	Cheyenne	1880	94	Fort Laramie	1876	107	27

Table of maximum and minimum temperatures for August, 1881.

State or Territory.	Signal service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Montgomery	97	68	Auburn		67
Do	Mobile		68			
Arizona	Florence and Yuma	110		Texas Hill	117	
Do	Prescott		41			
Arkansas	Little Rock	102	71			
California	Campo	102	30	Borden, Goshen, Ravenna & Newhall.	108	
Colorado	Denver	96				
Do	Pike's Peak		29	Fort Lyon	101	
Connecticut	New London	85	56			
Dakota	Smithville	112		Fort Pembina		36
Do	Fort Sully		42			
Delaware	Breakwater	93	60			
District of Columbia	Washington	101	57			
Florida	Jacksonville	96	70	Houston	100	
Do	Punta Rassa		70	Fort Barrancas		65
Georgia	Augusta	100		Forsyth	101	
Do	Atlanta		65	McPherson Barracks	101	63
Iowa	Des Moines	103		Muscatine	104	
Do	Dubuque		51	Clinton		48
Idaho	Fort Lapwai	103				
Do	Eagle Rock		35			
Illinois	Cairo	103		Swanwick	110	
Do	Springfield & Champaign.		54	Morrison		48
Indiana	Indianapolis	101	55	Laconia	105	
Do				Spiceland		52
Indian Territory	Fort Gibson	106	65			
Kansas	Leavenworth	105	63	Independence	108	
Do				Topeka		39
Kentucky	Louisville	105	63			
Louisiana	Shreveport	105	68			
Maine	Portland	89				
Do	Eastport		51			
Maryland	Baltimore	98	60	Owing's Mills		55
Massachusetts	Boston	97		Rowe		48
Do	Thatcher's Island		49			
Michigan	Detroit	99		Thornville	101	
Do	Marquette		41			
Minnesota	Saint Paul	96				
Do	Saint Vincent		36			
Mississippi	Vicksburg	99	71	Fayette	100	68
Missouri	Saint Louis	106	63	Pierce City		61
Montana	Fort Benton	108		Fort Ellis		30
Do	Rock Creek,		31			
Nebraska	Omaha	101		Lincoln	112	
Do	North Platte		48			
Nevada	Winnemucca	100	34	Golconda	103	
New Hampshire	Mount Washington	67	35	Auburn	98	
New Jersey	Sandy Hook	96		Acto	100	54
Do	Cape May		58	Vineland	100	
Do				Freehold		54
New Mexico	La Mesilla	98		Fort Union		40
Do	Silver City		46			
New York	Rochester and New York City.	96		Waterburgh and West Point.	99	
Do	Buffalo		50	Johnstown		42
North Carolina	Charlotte	101		Weldon	107	
Do	Kitty Hawk, Portsmouth, Wilmington & Smithville.		62	Highlands		53
Ohio	Cincinnati	101		Bellefontaine and Jacksonburg.	104	
Do	Cleveland		51			
Do				Westerville		48
Oregon	Umatilla	99		Fort Klamath		20
Do	Roseburg		43			
Pennsylvania	Pittsburgh	100	54	Milton	115	
Do				West Chester		35
Rhode Island	Newport	85	54	Fort Adams	93	53
South Carolina	Charleston	98	69	Stateburg		64
Tennessee	Nashville	103		Ashwood and Austin.	106	
Do	Knoxville		63			
Texas	Eagle Pass	108				
Do	Fort Davis		56			

Table of maximum and minimum temperatures for August, 1881—Continued.

State or Territory.	Signal service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Utah	Salt Lake City	100	48	Promontory and Corinne.	102	
Do				Coalville		30
Vermont	Burlington	94	50	Charlotte	102	
Do				Woodstock		44
Virginia	Cape Henry	103	60	Snowville		49
Do	Chincoteague		60			
Washington Territory	Almota	99				
Do	Dayton & Spokane		38			
West Virginia	Morgantown	92	52	Flemington	93	47
Wisconsin	La Crosse	96		Edgerton	103	
Do	Madison and Milwaukee.		52	Beloit and Neillsville.		49
Wyoming	Cheyenne	95	48	Fort Fetterman	98	
Do				Fort Bridger		33

PRECIPITATION.

The general distribution of rainfall for the month of August, 1881, is shown on Chart No. III, from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records (covering a period of many years) of Signal Service stations, and also a comparison of the present month with such averages. Upon an examination of the chart, and a comparison with the records for August for previous years, it is found that no such widespread and excessive deficiencies have occurred since the establishment of Signal Service stations. The drought of the present month has been almost without precedent for extent and severity, as will be seen by referring to the paragraph headed *Drought*. In 1873 the deficiency of precipitation was extensive in area, covering nearly three-fourths of the country, but the departure from normal in any district was comparatively small, while, on the contrary, for August, 1881, the deficiencies range from 0.16 inch in the Southern Pacific Coast region to 3.46 inches in the Middle Atlantic States, the latter deficiency being the largest ever yet reported. In previous years large deficiencies were reported as follows: 1874, West Gulf States, 3.40 inches; 1876, New England, 3.06 inches; 1877, Middle Atlantic, 2.50 inches; 1878, Upper Missouri Valley, 1.96 inches; 1879, Lower Missouri Valley, 1.88 inches. It is interesting to note that the regions of excess for the month of August, during the past eight years, have been almost invariably the Florida peninsula and Minnesota, while the regions of deficiency lying between covered the central portion of the country east of the 105th meridian. Another region of marked excess for the present month is found in central and eastern Arizona, western New Mexico and southern Colorado, where exceedingly heavy rains and serious floods have occurred. In the Middle Pacific Coast region the rainfall, though ranging from 0.00 to 0.05 inch, is normal. In the North Pacific Coast region there is an excess of 0.24 inch.

Deviation from average precipitation.—*Connecticut:* Southington, rainfall considerably below the average; nearly the whole amount for the month fell in one day. *Illinois:* Anna, rainfall considerably below the average of the past eighteen years. Riley, rainfall 2.67 inches below the average of the past twenty years; driest August occurred in 1864. *Kansas:* Manhattan, driest since 1874. *Maine:* Gardiner, rainfall 1.49 inches below the average of the past forty-five years. *New Jersey:* Paterson; monthly rainfall 1.13 inches; smallest since 1836. *Missouri:* Saint Louis, Missouri Weather Service reports monthly rainfall as 0.27 inch, or 3.76 inches below the average of the past forty-five years. But once in this period has the monthly rainfall been less, viz, in August, 1873, when 0.04 inch fell; the smallest monthly rainfall (0.02 inch) occurred in September, 1871. Throughout the State there has been extreme suffering from drought which began about the middle of July. Grass completely dried up, and in many places has been burned, leaving the ground black and charred. In respect to extent and severity, the present drought strongly resembles that of 1854.

Special heavy rainfalls.—Dyberry, Pa., 1.00 inch in 15 minutes; Morriston, Dak., 3.20. 2d, New Shoreham, R. I., 2.04; Lake Village, N. H., 3.44 in 1 hour; Weir's Bridge, N.

H., 1.92; Escanaba, 1,55. 2d and 3d, Pensacola, Fla., 10.41; Fort Barrancas, Fla., 9.53; Embarrass, Wis., 3.40. 3d, Mobile, 6.20; Duluth, 2.18. 4th, Mobile, 3.10; Fort Barrancas, 3.50; Montgomery, 1.56. 4th and 5th, Pensacola, Fla., 7.47. 5th, Mobile, 3.56; Fort Barrancas, Fla.. 2.80. 5th and 6th, Alpena, 2.23; Port Eads, La., 7.11. 6th, Westerville, Ohio, 2.80; Vicksburgh, 2.39. 7th, Freehold, N. J., 1.25 in 1 hour; Port Jervis, N. Y., 150; Lenoir, N. C., 1.90; Mount Washington, 1.71; Augusta, 2.79; Barnegat, 4.86; Fort Hamilton, N. Y., 1.80; Plattsburgh Barracks, 1.53; Silver City, N. Mex., 1.87; New Haven, Conn., 1.81; Fort Columbus, N. Y., 2.24. 8th, Orono, Me., 2.95; Rio Grande, Tex., 4.03. 9th, Rio Grande, Tex., 1.60. 11th, Port Eads, La., 3.45. 12th, Wickenburge, Ariz., 1.70 inches, 40 minutes; Pike's Peak, 2.09. 13th, Elsworth, N. C., 1.75; Florence, Ariz., 1.27. 14th, Fort Verde, Ariz., 1.99. 15th, Silver City, N. Mex., 1.93; 16th, Key West, Fla., 2.25. 16th and 17th, Duluth, 2.05. 17th, La Crosse, 1.43; Cresco, Iowa, 1.52; Silver City, N. Mex., 1.65. 18th, Pike's Peak, 1.57. 19th, Elsworth, N. C., 1.50. 19th and 20th, Dodge City, 2.16. 20th, Fort Scott, Kans., 1.48. 20th and 21st, Mount Washington, 4.34. 22d, Orono, Me., 1.80; Fort Pembina, Dak., 2.00. 23d, Morriston, Dak., 1.20 inches, 2 hours; Fort Davis, Tex., 2.00. 25th and 26th, La Crosse, 2.66; Neilsville, Wis., 2.20. 26th and 27th, Smithville, N. C., 3.37. 27th and 28th, Charleston, 5.84; Savannah, Ga., 4.33; Wilmington, 3.97. 28th, Fort Macon, N. C., 1.76. 28th and 29th, Highlands, N. C., 2.40; Elsworth, N. C., 3.13; Atlanta, Ga., 2.61. 29th, Pierce City, Mo., 2.00; Lexington, Mo., 2.27. 29th and 30th, Leavenworth, 2.16. 30th, Morriston, Dak., 1.60 in 1 hour and 30 minutes; Kansas City, Mo., 2.00. 31st, Springfield, Ill., 3.18; Des Moines, 2.15; Saint Meinrad, Ind., 1.80.

Largest monthly rainfalls.—Pensacola, Fla., 18.52 inches; Fort Barrancas, Fla., 16.71; Mobile, 15.22; Port Eads, La., 14.16; Mount Washington, 11.96; Pike's Peak, 11.29; Jacksonville, 10.23; Savannah, 9.63; Silver City, N. Mex., 8.69; Morriston, Dak., 8.60; Elsworth, N. C., 7.63; Fort Verde, Ariz., 7.53; Duluth, 7.36; Neillsville, Wis., 7.30; Punta Rassa, Fla., 7.28; Charleston, 7.25; Key West, 6.96; Escanaba, 6.87; Macon, N. C., 6.75; Davis, Tex., 6.32; Indianola, 6.30; Santa Fé, 6.28; Auburn, Ala.- 6.03.

Smallest monthly rainfalls.—San Francisco, Sacramento, Red Bluff, Point San Jose, Alcatraz Island, Salinas City, San Gorgonio, Oakland, Pleasanton, Benicia Barracks, Livermore, Tracy, Lathrop, Stockton, Angel Island, Galt, Brighton, Rocklin, Colfax, Alta, Cisco, Summit, Truckee, Marysville, Chico, Tehama, Martinez, Antioch, Dunnigan, Williams, Willows, South Valejo, Napa, Calistoga, Suisun, Davis, Turlock, Merced, Goshen, Tulare, Delano, Sumner, Caliente, Keene, Tehachapi, Newhall, San Fernando, Spadra, Colton, Indio, Farmington, Anaheim, Petaluma, Niles, Auburn, Brentwood, Byron, Woodland, Knight's Landing, San Mateo, Menlo Park, Tennant, Gilroy, Hollister, Pajaro, Solidad, Monterey, Santa Cruz, Kingsburg, Mojave, and Ione, Cal., Boise City, Idaho, Fort McDermitt, Boca, Browns, Humboldt, Reno, Toano, and Halleck, Nev., Terry's Landing, Mont., Louisiana, Jefferson City, and Warsaw, Mo., Evansville, Ind., Paducah, Ky., Muscatine, Iowa, and Clarksville, Tex., none; Los Angeles, Cal., Fort Gibson and Charleston, Ill., trace; O'Fallon and Big Creek, Mo., and San Diego, 0.01 inch; Hot Springs, Nev., and Ogden, Utah, 0.02; Visalia, Cal., and Fort Custer, Mont., 0.03; Decatur, Tex., and Poway, Cal., 0.04; Cuba, Mo., and Redding, Cal., 0.05; Fort Washakie, Wyo., and Swanwick, Ill., 0.06; Winnemucca, Nev., 0.07; Confluence, Pa., Yuma, Ariz., and Carson City, Nev., 0.08; Mexico, Mo., 0.09; Fort Bidwell, Cal., Geneseo, Ill., Ruggles, Ohio, and Wadsworth and Golconda, Nev., and Herman and Hannibal, Mo., 0.10; Cairo, 0.11; Point Pleasant, La., and South Orange, N. J., 0.12; Beowawe, Nev., 0.13; Tecoma and Battle Mountain, Nev., and Louisville, 0.15; Cleveland, 0.17; Fort Missoula, Mont., 0.18; Rapid City, Dak., Fort Concho, Tex., Bell Plain, Kans., and New Castle, Pa., 0.20; Corsicana, Tex., 0.21; Dayton, Wash. T., 0.22; Deer Lodge, Mont., and Texas Hill, Ariz., 0.24; Fort Griffin, Tex., and Lincoln, Nebr., 0.25; Denison, Tex., 0.26; Brackettville, Tex., Little Mountain, Ohio, and Lynchburgh, Va., 0.30; Cumberland and Saint Louis, 0.31; Rockford, Ill., and Ravenna, Cal., 0.33; Franklin, Pa., and Terrace, Nev., 0.34; Levi and South Haven, Kans., 0.35; Elko, Nev., 0.36; Castroville, Tex., and Anna, Ill., 0.38: Ithaca, N. Y., 0.39; Marietta, Ohio, Marysville, Nebr., and Greensborough, N. C., 0.40; Fort Brady, Mich., Wichita, Kans., Clear Creek, Nebr., Brook Haven, N. Y., and Otego, Nev., 0.41; Fort Niagara, N. Y., and Fort Bridger, Wyo., 0.42; Genoa, Nebr., and Shreveport, 0.45; Roseburgh, Oreg., and White Water, Cal., 0.46; Madison Barracks, N. Y., and Kalamazoo, Mich., 0.47; Wabash, Ind., 0.48; Fort Elliot, Tex., 0.49; Fort Sully, Dak., and Ashwood, Tenn., 0.50.

Rainy days.—The number varied in New England from 5 to 21; Middle Atlantic States; 5 to 13; South Atlantic States, 6 to 16; Eastern Gulf States, 5 to 11; Western Gulf States, 1 to 13; Ohio Valley and Tennessee, 3 to 15; Lower Lake region, 5 to 8; Upper Lake region, 6 to 18; extreme Northwest, 6 to 16; Upper Mississippi Valley, 4 to 13, Missouri Valley, 5 to 13; Northern Slope, 0 to 12; Middle Slope, 3 to 20; Southern Slope; 3 to 17; Rio Grande Valley, 4 to 9; Southern Plateau, 8 to 18; Middle Plateau, 2 to 9, Northern Plateau, 0 to 9; North Pacific Coast region, 7 to 13; Middle Pacific Coast region, 0 to 1; South Pacific Coast region, 1 to 3.

Cloudy days.—The number varied in New England from 5 to 12; Middle Atlantic States, 1 to 7; South Atlantic States, 1 to 14; Eastern Gulf States, 2 to 7; Western Gulf States, 0 to 5; Ohio Valley and Tennessee, 0 to 6; Lower Lake region, 1 to 6; Upper Lake region, 3 to 12; Upper Mississippi Valley, 0 to 8; Missouri Valley, 3 to 10; Extreme Northwest, 3 to 7; Northern Slope, 0 to 12; Middle Slope, 1 to 8; Southern Slope, 0 to 3; Rio Grande Valley, 0 to 5; Southern Plateau, 1 to 12; Middle Plateau, 0 to 5; Northern Plateau, 0 to 4; North Pacific Coast region, 4 to 8; Middle Pacific Coast region, 0 to 2; South Pacific Coast region, 0 to 3.

Snow.—Pike's Peak, 21st, 27th, 29th.

Hail storms were of frequent occurrence in the various districts, the most destructive being reported as follows: Rochester, N. Y., 6th, hailstones size of marbles; eight quarts were gathered from a piece of canvas six feet square; some hailstones measured 4½ inches in circumference; much damage to window-glass, shade trees, and vegetables. Amboy, Minn., 19th, hailstones large enough to cut holes through the roofs of barns and houses; corn and fruit almost entirely ruined; storm passed from northwest to southeast down the Minnesota Valley, damaging crops and buildings to a large extent. Port Huron, Mich., 5th, five miles west of station, very heavy; fields of corn cut into ribbons and almost ruined; all crops more or less damaged; hail fell in great quantities. Friendship, N. Y., 1st, between 8 and 9 p. m.; passed from southwest to northeast; hailstones 1¼ inches in diameter to the depth of four or five inches in places; great damage done to oats, corn, gardens, and fruit; width of path very narrow. Bellefontaine, Ohio, 6th: hailstones size of hazel-nuts; very destructive to crops. Fort Lincoln, Dak., 3d, hailstones half an inch to two inches in diameter. Morriston, Dak., 23d, hailstones very large and caused much damage; some were two inches long by one and a half wide. Bismarck, 3d, breaking windows; hailstones measured one inch in diameter; hundreds of acres of grain and all vegetables in immediate vicinity totally destroyed.

Drought.—Arkansas.—Little Rock, 10th, very dusty; crops dying throughout the State for want of rain; vegetation literally burned up. 26th, crop reports from all parts of the State are very discouraging except from river valleys. 27th, river so low that all navigation is suspended above this point. *Canada.*—Toronto, 31st, reports from various parts of the Province of Ontario state that suffering from want of rain is almost unprecedented; pastures have been ruined, root crops, Indian corn, and fruit damaged severely; earth baked and streams and wells fast drying up; farmers in many instances are obliged to drive their animals long distances for water. *Connecticut.*—Southington, 31st, most disastrous for years; crops and stock suffering severely; seeds will not germinate; grass dying, wells drying up. *Indian Territory.*—Fort Gibson, 8th, wells and streams drying up; cattle suffering for water. 10th, scarcity of water creating great alarm; all kinds of vegetation completely burned up. 21st, river very low, many of its small tributaries entirely dry. 26th, drought continues with alarming effects. 31st, the long-continued drought has blighted the last prospect for even an average crop of any farm product; farmers compelled to haul water long distances. *Illinois.*—Rinard, 31st, first rain after an unbroken drought of over sixty days. Claremont, 31st, first rain for several weeks; the potato crop will be saved, but corn is ruined. Lincoln, 31st, first rain for many weeks. Ottawa, 31st, first rain for nearly one month; vegetation nearly destroyed. Dundee, 31st, first rain for several weeks; corn will yield about half a crop; all crops badly damaged. Mattoon, 5th, air filled with clouds of dust; vegetation parched and burned up. Quincy, 5th, crops on bottom lands doing very well, but on the hills suffering severely. La Harpe, 4th, corn and grass crops nearly ruined; no rain for several weeks. Hennepin, 4th, everything drying up, greatest suffering in past fifty years. Danville, 5th, the protracted drought still continues; corn severely damaged. Chenoa, 5th, corn, grass and oats suffering dreadfully; no such drought before for many years. Clinton, 5th, the corn crop of De Witt County has been damaged to the extent of $30,000; about 40,000 acres, or one-half of the entire amount of corn planted in the spring, is utterly ruined. Assumption, 5th, on both sides of the Illinois Central Railroad, as far as the eye can reach, the country appears like a great desert; corn is ruined beyond recovery, and will not make fodder; pasture lands are baked hard, and resemble graveled streets before they are sprinkled; the loss to crops and the suffering of stock is unprecedented. Vandalia, 12th, first rain in five weeks; corn badly burned and shriveled and pastures ruined. Fairfield, 12th, field and garden products "all burned up;" no rain since the 1st of June; stock suffering for want of food and water. Geneseo, 5th, great damage to corn; only half a crop expected; in pastures the ground is baked hard, and the grass has turned brown. Centralia, 5th, no rain for seven weeks; "everything as dry as a tinder-box;" roads terribly dusty; corn and oat crops complete failures; cisterns all dry and wells getting very low. Sandoval, 9th, wells dry; almost impossible to get water for stock; corn crop ruined. Bunker Hill, 9th, almost a water famine;

corn and pastures "literally burned up." Salem, 9th, vegetation scorched and ruined; greatest scarcity of water for many years; stock suffering dreadfully. Cairo, 11th, not enough rain in the past eight weeks to lay the dust, which is from four to six inches deep; yield of crops reduced one-half throughout nearly the whole of southern Illinois. *Indiana.*—Lafayette, 5th, no rain for past six weeks, crops suffering badly. New Albany, 12th, "crops literally burned up;" corn in many places not worth harvesting for fodder; streams dried up, pastures scorched into an arid waste, and the leaves on the trees "almost as dry as tinder;" no rain for ten weeks; great suffering among people and animals. Evansville, 12th, corn crop in this section of the State almost an entire failure; no rain for eight weeks; reports from Warwick, Posey, and Gibson Counties say the yield of all crops will be reduced one-half; fruit is nearly all destroyed; vegetables are "absolutely burned up." Logansport, 31st, month unusually dry; vegetation has suffered terribly. Saint Meinrad, 31st, drought very severe; crops seriously injured; hardly any rain has fallen since the latter part of June. Rising Sun, 31st, all farm crops have suffered severely; corn and potatoes will not yield half a crop. Vevay, 31st, continued drought throughout the month; crops and stock suffered badly. Indianapolis, 31st, crops suffering severely; grass is completely parched; potatoes and other vegetables nearly destroyed. *Iowa.*—Boone, 5th, crops in the vicinity and throughout the central portions of the State suffering greatly; oats, wheat, and corn reduced to half a crop. Clinton, 31st, month extremely dry; no rain has fallen in this locality since the 21st of July; all crops seriously damaged. Fort Madison, 31st, month very dry; crops suffering; wells and streams drying up; water carried long distances for domestic purposes. *Kansas.*—Atchison, 12th, first rain for several weeks; the prolonged drought has reduced the yield of crops one-half. Independence, 31st, all vegetation nearly ruined; water becoming very scarce; corn will harvest about one-third a crop. Fort Scott, 31st, month very dry; wells and streams low. Holton, 31st, month excessively dry; corn and potato crops seriously damaged. Yates Center, 31st, drought very severe; wells and streams lower than ever known before. Clay Centre, 31st, drought unusually severe; plants, grass, and trees fading as in October; farm crops seriously injured. Leavenworth, 11th, vegetation almost burned up by the continued dry weather; corn and wheat total failures; 26th, vegetation completely destroyed; 28th, almost all cisterns and a large number of wells about the town are exhausted; people are compelled to haul water from the river for domestic purposes; farmers driving their stock several miles for water. *Kentucky.*—Louisville, 5th, "country round about fairly burning up;" no rain since the 14th of July. Millersburgh, 12th, no rain since the 1st of June; corn crop a total failure; fields are scorched brown, and ponds, cisterns, creeks, and wells are dry; the water supply nearly exhausted. Paducah, 12th, unprecedented drought; damage to crops very great; people and animals suffering dreadfully. *Louisiana.*—Shreveport, 11th, the long-continued drought has proven very destructive to crops; 27th, ferry stopped running because of extremely low water. *Maryland.*—Emmittsburg, 31st, month unusually dry; crops suffering; wells and streams very low. Sandy Springs, 31st, drought very disastrous; crops greatly injured; water very scarce; vegetation covered with dust, and rapidly drying up. *Massachusetts.*—Westborough, 31st, drought very severe; most of the farm crops a total failure; water very scarce. *Missouri.*—Hannibal, 12th, the long-continued drought very disastrous to the corn crop and pasture fields. *Michigan.*—Memphis, 5th, weather intensely hot; grass so dry that it crumbles to powder when trod upon; all kinds of fruit nearly ruined; cattle driven several miles for water. Sanilac and Huron Counties, 5th, drought very serious and almost unprecedented; crops in a terrible condition. Lapeer County, 5th, no rain since the 1st of July; crops and stock suffering severely; along Saint Clair River farmers hauling water for several miles. Saint Clair County, 5th, dryest for many years; oat and corn crops seriously damaged; wells, springs, and streams dried up; stock suffering severely. Litchfield, 31st, month unusually dry; but for the heavy dews spring crops would have been ruined; upland pastures are so dry that farmers have to feed their stock; water very scarce. Thornville, 31st, worst drought ever experienced in this section of the State; water has been a luxury hard to obtain. Detroit, 31st, by reason of excessive and continuous drought shade trees are almost leafless and grass and vegetables are nearly burned up. *Mississippi.*—Fayette, 31st, very severe throughout the month; all crops seriously injured; pastures, streams, and wells rapidly drying up. Vicksburgh, 28th, crops severely injured from long-continued drought. *New Hampshire.*—Auburn, 31st, drought unusually severe; vegetation rapidly drying up; farm crops seriously injured. *Nebraska.*—Lincoln, 12th, first rain for several weeks; crops very badly damaged. Clear Creek, 29th, everything suffering for want of rain; farm crops drying up. *New Jersey.*—Freehold, 31st, very severe throughout the month; roads full of dust; crops seriously damaged; wells and streams rapidly drying up. Somerville, 31st, great damage to the corn and potato crops; pastures have dried up to such an extent that farmers are obliged to feed their stock. *New York.*—Palermo, 31st, a terrible drought prevailed throughout the month; crops nearly ruined; stock suffering for water. Ardenia, 31st, garden and farm crops nearly destroyed; pastures rapidly drying up. Cooperstown, 31st, month unusually dry. Waterburgh, 31st, vegetation seriously damaged; water very scarce. Oswego, 31st, very serious in surrounding country; no rain since 13th. Buffalo, 31st, reports from surrounding country state that there will be large losses in all farm crops; grass almost entirely burned up. *North Carolina.*—Weldon, 30th, everything suffering for want of rain; all crops seriously injured; Roanoke River has fallen so low that it can be waded across. *Ohio.*—Cincinnati, 21st, a terrible drought still continues; vegetables are entirely ruined, but there is still hope for farm crops. Knox County, 31st, farmers compelled to drive their stock long distances for water; corn and potato crops almost a failure; pastures drying up, causing great suffering among stock; no rain since July 15th. Fairfield County, 31st, drought very serious; corn and potato crops nearly ruined. Champaign County, 31st, most destructive within the memory of the oldest inhabitant; potatoes almost a complete failure; "pastures are burned up;" many fat hogs have died for want of water; one farmer lost seventeen. Clinton County, 31st, pastures destroyed; great scarcity of water for farm and domestic purposes; corn, half a crop. Tuscarawas County, 31st, worst drought since 1838; Tuscarawas River lowest for many years; crops and stock suffering severely. Perry County, 31st, worst since 1874; pastures dried up; corn, oats, and potatoes nearly ruined. Sandusky, Columbiana, Crawford, Allen, Stark, Wyandot, Wayne, and Seneca Counties, 31st, drought continues without abatement; but little rain for the past six weeks; apples are falling off and rotting; peaches have wilted and dried on the trees; corn and potatoes a complete failure, ground too hard for plowing. Preble County, 31st, drought unprecedented; water cannot be obtained without the greatest difficulty; all crops nearly destroyed. Madison County, 31st, very severe; corn, oats, potatoes, and fruits destroyed. Athens County, 31st, most damaging for years; water very scarce. Coshocton County, 31st, no abatement in the long-continued drought; stock and crops suffering greatly. Morrow County, 31st, no rain for several weeks; crops nearly destroyed. Darke, Licking, Montgomery, Washington, Union, Gallia, Clermont, Scioto, and Holmes Counties, 31st, the most destructive ever experienced; farmers selling off their stock because there is no food for them; great suffering among the people for want of water. Warren County, 31st, most destructive and continued for many years; scarcely any rain for the past four months; corn, potato, and tobacco crops seriously damaged; many hogs have died for want of water; wells and streams dry. Butler County, 31st, worst in past twenty-five years; cattle almost in a starving condition; farmers compelled to haul water for many miles. Picaway County, 31st, cattle starving; wells and streams dry; corn will average about half a crop; "pastures burned up;" most destructive since 1854. Hancock County, 31st, crops terribly damaged; stock suffering for want of water and pasture. Brown County, 31st, stock suffering dreadfully for want of water; corn, oats, and potatoes a total failure. *Pennsylvania.*—Pittsburgh, 30th, no rain for past seventeen days, and during the entire month the precipitation has not been one inch; information from the surrounding counties shows the most disastrous drought for many years; the rivers are lower than for the past ten years. Catawissa, 31st, severest drought ever known; all small streams rapidly drying up and crops suffering terribly; forest trees have actually died for want of moisture; suffering on every hand is without precedent in this part of the State. Milton, 31st, most destructive ever known; many wells exhausted, streams dried up, and people compelled to haul water long distances; corn crop a heavy failure. Erie, 31st, no rain since 13th; crops severely injured. Chambersburg, 31st, drought very severe; corn will yield only about one-third of a crop; ground baked hard, rendering it impossible to plow. Wellsborough, 31st, wells and streams drying up; potatoes, corn, and buckwheat nearly ruined; water very scarce. *South Carolina.*—Darlington, 5th, most disastrous effects for many years; pease, potatoes, and corn will yield hardly half a crop; wells, streams, and cisterns dry; stock suffering severely. *Tennessee.*—Columbia, 2d, first rain in past two months; whole southern part of State suffering severely; crops terribly reduced. Nashville, 2d, surrounding country suffering beyond precedent; springs that were never known to fail, or hardly diminish the usual supply, are now dry, corn standing in the fields has lost all of its sap, and is as dry and brown as if cured for a year; pasturage everywhere is parched and deprived of all value as food; Irish potatoes are worthless; melons, one of the principal products of the State, completely failed; in East Nashville, wagons, carts, and expresses busily engaged in hauling water from the Cumberland River for use in the city; light rains began on the 4th, mitigating the severity of the past dry spell. Ashwood, 31st, unusually severe drought throughout the middle portion of the State; not sufficient rain to lay the dust for the past sixty-four days; from the 10th to 13th, inclusive, the heat was so oppressive that it seemed as if the air came in blasts from a furnace. Clarksville, 31st, no rain has fallen during the month; injury to crops "immense;" grass "entirely burned up;" wells and cisterns dry; water for stock has become very scarce, and only large streams are running. *Texas.*—Fort McKavett, 19th, this section of country has suffered from long-continued drought during most of the summer months; very little rain has fallen for the past four weeks; stock men complain about the scarcity of grass, even in lowland pastures. Denison, 31st, drought in this section is unprecedented; fruit and forest trees dying in great numbers; the earth in many places is cracked sufficiently to admit small animals; cattle famishing for want of water, and stock men report great loss in the herds; fruit and corn almost a total failure; cotton, half a crop. Brackettville, 20th, great suffering from want of rain; cattle dying; 31st, sheep men state that unless rain soon falls their losses will be very heavy. *Virginia.*—In the south and southwestern portions of the State there have been but two or three light rains since the latter part of May; corn and grass crops a complete failure; in the southwest portion the grass has been entirely destroyed, and graziers compelled to cut off the branches of trees to be used as forage for stock; there has been no such season since the great drought of 1806. Richmond, 31st, a very severe drought still continues throughout this portion of the State; streams are drying up, and manufacturers and farmers are greatly inconvenienced; James River lower than for the past fifty years; tobacco and fall crops an entire failure; the dust is fearful. Snowville, 31st, driest month ever known in this locality; river lower than ever before known; crops and stock suffering for water. Norfolk, 31st, all kinds of vegetation drying up; river very low; never before within the memory of the oldest inhabitants has Virginia experienced such a drought. Lynchburgh, 31st, the long-continued and unprecedented drought has irreparably injured crops; in the southwestern portion of the State, where grazing is chiefly carried on, the corn crop has been cut for use as fodder; except on bottom lands the corn and tobacco crops are totally lost. *West Virginia.*—Flemington, 21st, driest month ever known; corn crop badly damaged; pastures drying up. Helvetia, 31st, no rain has fallen since the 13th; monthly rainfall smallest (with one exception) in the past five years; river lower than ever known before. Morgantown, river exceedingly low; vegetation suffering severely. 21st, corn crop almost a total failure. 26th, vegetation dying; water in river lower than for many years. 29th, river bed under suspension bridge nearly dry.

WINDS.

The prevailing winds during the month of August, 1881, at Signal Service stations are shown on Chart No. II by arrows, which fly with the wind. In the Middle Atlantic States and New England, southeast to southwest; South Atlantic States, northeasterly; West Gulf States and Texas, east and southeast; Lower Lake region, northerly; Upper Mississippi and Lower Missouri Valleys, southerly; Northern Plateau and Northern Pacific Coast regions, northwesterly; Southern Plateau and Southern Pacific Coast regions, southerly; elsewhere, variable.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 18,908 miles; North Platte, 11,795; Portsmouth, N. C., 11,330; Hatteras, 10,681; Moorhead, Minn., 9,646; Kittyhawk, 9,618; San Francisco, 9,409; Port Eads, La., 9,084; Huron, Dak., 8,856; Chincoteague, Va., 8,476; Fort Keogh, Mont., 8,381; New Shoreham, R. I., 8,278; Delaware Breakwater, 8,233; Fort Buford, Dak., 8,217; Macon, N. C., 8,150; Eagle Rock, Idaho, 8,123; Dodge City, 8,039. The smallest are: La Mesilla, N. Mex., 902; Silver City, N. Mex., 1,306; Phœnix, Ariz., 1,377; Florence, Ariz., 1,729; Lynchburg, 1,793; Memphis, 1,910; Uvalde, Tex., 2,051; Morgantown, 2,236; Fredericksburg, Tex., 2,316; Roseburg, Oreg., 2,435; Washington, 2,543; El Paso, Tex., 2,568; Olympia, 2,624; Lewiston, Idaho, 2,671; Red Bluff, Cal., 2,679; Springfield, Mass., 2,826; Visalia, Cal., 2,828; Pittsburgh, 2,917.

High winds.—Winds of 50 miles per hour and over were reported as follows: On summit of Mount Washington, 5th, 6th, 7th, 9th to 14th, 31st; maximum velocity 90 miles, NW., 31st. Savannah, 80, N., 27th. Indianola, 56, N., 6th. Charleston, 54, NE., 27th. Bismarck, 50, W., 3d. Delaware Breakwater, 50, SW., 13th. Smithville, N. C., 50, E., 27th.

Local storms.—Minneapolis, Minn., 5th, a violent northwest storm passed over the central portion of the State, moving thence over Western Wisconsin, committing damage in parts of Washington, Pierce, and Dunn Counties. Many buildings were blown down or unroofed, hay and grain stacks scattered for miles along the course of the storm, fences demolished, and telegraph wires broken. Coney Island, N. Y., 26th, very violent wind storm, sweeping a heavy sea over the marine promenade, causing a tremendous surf, and badly damaging two vessels. Spencer, Iowa, 5th, about 4 p. m. dark heavy clouds gathered rapidly in the northwest and southwest, and moved eastward toward a common point. Upon meeting the clouds could be seen rolling over each other and tumbling about in a fearful manner, followed soon after by the formation of a long, narrow cloud like a water-spout. Twenty buildings were blown down and two persons killed. Fields of corn in the path of the storm were left as flat as if rolled. All crops were beaten into the ground; width of storm's path from a half to three-fourths of a mile; length about 25 miles. Cleveland, Ohio, 12th, about 8 p. m. violent wind storm visited the east side of the city; roof of the union freight depot torn off, a heavy timber 20 feet long and 9 inches square was carried 60 feet; three pinnacles from Saint Paul's Church blown down; fences, shade trees, awnings, and chimneys were quite generally damaged, and in many cases completely demolished; lumber piles were scattered in every direction; the lake as far as the eye could reach was lashed into a foaming mass, causing considerable damage to vessels; sailors along the docks stated that the squall was the most violent for many years. Petersburgh, Va., 13th, about 5 p. m., heaviest storm for years; rain fell in torrents, and the wind reached an estimated velocity of over 60 miles per hour; many buildings were unroofed and others demolished; trees, fences, signs, awnings, and chimneys were destroyed in various parts of the city; beyond the city the loss to farmers from damage to their crops and orchards was very great. Franklin, N. C., 13th, very violent southwest storm; path of destruction from 1 to 1½ miles wide. Chambersburgh, Pa., 13th, 1.50 p. m., violent southwest storm; several houses and one church demolished; many buildings were unroofed; trees and fences were blown down throughout the course of the storm. Milton, Pa., 6th, violent southwest storm; several buildings and also fences and trees blown down; path of destruction narrow. Fort Barrancas, Fla., 3d, violent gale with heavy and continuous rain; trees uprooted, buildings unroofed, and two vessels driven upon the beach and completely wrecked.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England 74 to 90; Middle Atlantic States, 54 to 84; South Atlantic States, 56 to 82; Eastern Gulf States, 66 to 78; Western Gulf States, 50 to 80; Ohio Valley and Tennessee, 52 to 69; Lower Lake region, 62 to 71; Upper Lake region, 64 to 79; extreme Northwest, 60 to 66; Upper Mississippi Valley, 53 to 80; Lower Missouri Valley, 56 to 79; Northern Slope, 35 to 57; Middle Slope, 55 to 76; Southern Slope, 48 to 67; Rio Grande Valley, 54 to 64; Southern Plateau, 55 to 71; Middle Plateau, 24 to 37; Northern Plateau, 32 to 62; North Pacific Coast region, 63 to 77; Middle Pacific Coast region, 35 to 79; South Pacific Coast region, 50 to 73.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for August, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 88.8 per cent. The percentage for the four elements are: Weather, 88.4; wind, 85.4; temperature, 91.4; barometer, 90.1 per cent. By geographical districts they are: For New England, 89.7; Middle Atlantic States, 90.3; South Atlantic States, 91.3; Eastern Gulf States, 91.7; Western Gulf States, 95.1; Lower Lake region, 92.7; Upper Lake region, 87.0; Tennesecee and Ohio Valley, 88.7; Upper Mississippi Valley, 80.7; Lower Missouri Valley, 80.1; Northern Pacific Coast region, 67.9; Central Pacific Coast region, 100.0; Southern Pacific Coast region, 100.0. There were 92 omissions to predict (49 being due to the absence of reports from the Pacific coast) out of 3,813, or 2.4 per cent. Of the 3,721 predictions that have been made, 100, or 2.68 per cent., are considered to have entirely failed; 71, or 1.91 per cent., were one-fourth verified; 414, or 11.13 per cent., were one-half verified; 229, or 6.15 per cent., were three-fourths verified; 2,907, or 78.13 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—Sixty cautionary signals were displayed during the month, of which 45, or 75.0 per cent., were fully justified by winds of 25 miles per hour or over, at or within a radius of 100 miles of the station. No off-shore signals were displayed. The above does not include signals ordered at display stations where the velocity is only estimated. Seventy-six winds of 25 miles or over were reported for which no signals were ordered. Fourteen signals were ordered late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water, as observed at Signal Service stations during the month of August, 1881. Throughout the country the rivers have been extremely low during the month. In no instance have they reached the danger line, or within six feet of it. The position of the highest water with respect to the danger point in the various rivers is shown as follows: Figures indicate the depression of highest water in feet and inches below the danger line. Red River, 28 feet; Missouri, 7 feet 5 inches to 14 feet 4 inches; Mississippi, 6 feet 5 inches to 27 feet 10 inches; Ohio, 18 feet to 40 feet 7 inches; Cumberland, 39 feet 4 inches; Tennessee, 27 feet 8 inches; Monongahela, 26 feet 4 inches to 27 feet.

Floods.—Mobile, 2d, very heavy rains continuing up to night of the 5th; streets and houses flooded, causing considerable damage; the counties of Baldwin and Conecuh, across Mobile Bay to the eastward, were almost completely inundated; travel on the Louisville and Nashville Railroad seriously impeded by heavy washouts; along some portions of the track water so deep that the work of repairing could not be prosecuted; several small vessels wrecked on the bay. Pensacola, Fla., 2d, remarkably heavy rains; 15.80 inches fell from the morning of the 2d to the morning of the 5th; Pensacola Railroad badly washed in several places; all communication closed; in the west Florida counties the country is inundated for miles; several vessels wrecked along the Gulf coast. Corpus Christi, Tex., 31st, unusually heavy rain; streets and basements flooded; considerable damage to property. Visalia, Cal., 8th, heavy rains in mountains, flooding all the neighboring streams. Silver City N. Mex., 7th, very heavy rain; streets flooded; 15th, floods from mountain streams doing considerable damage; 20th, streets flooded. Phœnix, Ariz., 17th, very destructive in Salt River Valley; loss to seeded grain estimated at $60,000; mail and all other communications interrupted. Laredo, Tex., 19th, heavy rains; river flooded; property removed to safer places. *Colorado.*—Denver, 20th, the extensive and heavy rains of the past few days caused great loss to property in the central portion of the State; the railroad companies suffered the greatest damage, nearly every road in the State experiencing heavy washouts or the loss of bridges; some of the washouts extended for a continuous length of five miles. Montgomery, Ala., 3d, several heavy washouts on the Louisville and Nashville Railroad; no trains arrived from New Orleans for 36 hours; the heavy and continuous rains of the week caused serious damage to crops, particularly cotton. Dunlap, Tenn., 15th, very heavy rains throughout Sequachie County; bridges destroyed and fields badly washed.

Water-spouts.—Smithville, N. C., 14th, about 4 feet in diameter, moved over Oak Island from SW. to NE. Port Eads, 14th, two water-spouts formed under a cumulo-stratus cloud, which at the time was moving southward over the Gulf.

Cloud burst.—Central City, Gilpin County, Colorado, 8th, about 4 p. m., a dark, heavy storm cloud approached from the west, accompanied by incessant thunder and lightning and a most terrible roar. The noise increased in intensity as the cloud drew nearer, when suddenly a large volume of water, 4 to 6 feet deep, came rushing down Eureka and Nevada streets, carrying everything before it. Heavy teams standing in the streets were overturned and carried down with the rushing current, and bowlders weighing over six hundred pounds were rolled along like pebbles. The whole length of the valley, from Nevadaville to Eureka, presented a terrible scene of desolation. Roadways in many places were cut to a depth of six feet, and for a length of several hundred yards. At points between Central City and Blackhawk the *débris* was piled to a height of twenty-five feet. For long distances sand was gathered in heaps from 4 to 6 feet deep. Many houses were washed away and stores flooded; in the latter several feet of sand and mud were deposited. Loss in general estimated at $60,000. At Idaho Springs the storm was the severest ever experienced; several houses were carried away in Virginia cañon; many railroad and county bridges between the forks of the creek and the town were swept away; nearly all the houses in the business part of the town were flooded, and the stores badly damaged by water and mud; estimated damage in town, $20,000; the damage to the railroad between Idaho Springs and Floyd Hill was so great that it required the labor of one hundred men forty-eight hours to complete repairs. Salt Lake City, 14th, sixty miles south of station on American Fork cañon; houses, goods, and trees were carried away. Wickenburg, Ariz., 6th, north of station on the Passayampa River; at sunset the bed of this stream was perfectly dry, but before 11 p. m. water was running over a width of nearly a mile, from 2 to 15 feet deep, and with a current estimated at ten miles per hour; several teams were wrecked, and the loss of freight was estimated at from $7,000 to $10,000; 7th, at noon the river was again dry.

High tides.—Mobile, 3d, causing serious damage. Smithville, 21st, bath-houses swept away, wind blew at the rate of 84 miles per hour for about five minutes; considerable damage to the engineers' works on Smith's Island. Key West, 16th; Portsmouth, N. C.. 25th, 26th; Charleston, 27th.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of Chart No. III. Owing to sickness of observer, observations wanting at Punta Rassa on the 14th.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—In the various districts they were reported on the following dates: New England, 1st, 2d, 4th to 7th, 9th, 12th, 13th, 19th, 21st, 27th; Middle Atlantic States, 1st, 2d, 6th to 8th, 10th, 12th, 13th, 15th, 21st, 22d; South Atlantic States, 2d, 3d, 6th to 11th, 13th to 15th, 20th to 22d, 30th; Florida Peninsula, 1st, 2d, 4th to 10th, 14th, 19th, 22d, 23d to 25th, 29th; Eastern Gulf States, 2d to 7th, 10th to 15th, 20th to 25th, 30th; Western Gulf States, 5th to 7th, 9th, 11th, 12th, 14th to 16th, 20th to 23d, 25th, 27th, 30th, 31st; Ohio Valley and Tennessee, 4th to 9th, 11th to 14th, 18th to 21st, 23d to 26th, 29th to 31st; Lower Lake region, 1st, 2d, 6th, 7th, 9th, 10th, 12th, 31st; Upper Lake region, 2d to 6th, 9th, 11th, 12th, 16th, 19th, 25th, 26th, 31st; extreme Northwest, 1st, 4th, 8th, 10th, 16th, 21st, 22d, 26th, 28th, 29th; Upper Mississippi Valley, 2d to 6th, 11th to 13th, 16th to 18th, 20th, 23d to 26th, 29th to 31st; Lower Missouri Valley, 1st, 2d, 5th to 7th, 9th, 12th, 15th to 19th, 21st to 31st; Northern Slope, 2d, 4th, 7th to 14th, 16th, 19th, 21st, 25th to 31st; Middle Slope, 1st to 7th, 9th, 14th, 19th, 21st to 31st; Southern Slope, 1st to 6th, 8th, 12th, 13th, 14th, 16th, 18th, 20th, 21st to 23d, 28th to 30th, 31st; Rio Grande Valley, 1st, 2d, 6th, 7th, 9th, 12th, 13th to 15th, 19th, 20th, 22d, 23d, 30th, 31st; Southern Plateau, 1st to 20th, 22d to 25th, 27th, 28th; Middle Plateau, 4th, 6th, 7th, 9th to 11th, 14th, 16th, 18th; Northern Plateau, 4th, 7th, 13th, 14th, 16th, 18th, 20th, 21st, 24th, 26th, 28th, 29th; North Pacific Coast region, 13th, 26th, 30th; South Pacific Coast region, 5th to 11th.

Atmospheric electricity interfering with telegraphic communication.—Fort Missoula, Mont., 18th; Umatilla, 7th; Prescott, 7th; Pike's Peak, 21st; lightning arrester and grounding badly damaged; Jacksborough, Tex., 28th; Stockton, Tex., 22d, 23d; Fort Sill, 1st, 4th, 5th, 6th, 18th, 28th, 30th; Fort Bennett, 29th; Mason and Fredericksburg, Tex., 23d.

Auroras.—There were no consecutive displays reported between New England and the Northwest during the month. At isolated stations the following observations were reported: Eastport, 24th, 10.30 p. m.; Gardiner, Me., 20th, 9 p. m.; Newport, Vt., 24th; Strafford, Vt., 8th, 9 p. m.; Embarrass, Wis., 20th, 11 p. m.; Duluth, 13th, 11 p. m.; 24th, 9.30 p. m.; Clinton, Iowa, 7th, 1.30 a. m.; Clear Creek, Nebr., 19th, 24th, 25th, very faint; Saint Vincent, 5th, 9.30 p. m., single arch; 12th, 10 p. m., bright arch, altitude 10°, dark segment; 18th, 10 p. m., faint diffuse light; 20th, 10 p. m., a few long streamers, faint, and of short duration; 23d, from 8.30 to 9.40 p. m.; 24th, 9.40 p. m., faint; 26th, 8.30 p. m., bright, without streamers; Bismarck, 20th, 8.30 p. m., faint streamers; Fort Stevenson, Dak., 20th; Fort Keogh, Mont., 19th, 11.30 p. m., diffuse light; Springfield, Mass., 20th, 11 p. m., beautiful display, lasting nearly half an hour.

Zodiacal light.—Mobile, 15th; Nashville, 1st, 14th, 16th, 17th, 22d, 24th, 25th, 26th, 27th; Monticello, Iowa, 21st, 22d.

OPTICAL PHENOMENA.

Lunar halos have been observed in the various districts on the following dates: New England, 8th, 10th, 12th, 14th; Middle Atlantic States, 8th, 11th, 12th, 31st; South Atlantic States, 3d, 8th, 11th, 12th, 13th, 26th; Florida Peninsula, 2d, 3d, 5th, 10th; Eastern Gulf States, 1st 2d, 4th, 6th, 9th; Western Gulf States, Indianola, 10th, 11th; Ohio Valley and Tennessee, 5th, 8th, 9th, 10th, 11th, 14th; Lower Lake region, Sandusky, 8th, 11th; Upper Mississippi Valley, La Crosse, 12th; extreme Northwest, Moorehead, 28th; Middle Slope, 2d, 10th; Southern Plateau, 1st, 3d, 5th; Middle Plateau, Salt Lake City, 8th; California, Poway, 5th.

Solar halos have been observed in the various districts on the following dates: New England, 1st, 7th, 26th, 28th; Middle Atlantic States, 1st, 8th, 12th, 13th, 26th; South Atlantic States, 2d, 16th; Florida Peninsula, 9th, 15th; Eastern Gulf States, 14th, 18th; Ohio Valley and Tennessee, 1st, 3d, 8th, 10th, 19th, 24th, 27th; Lower Lake region, 8th, 24th, 26th; Upper Lake region, Alpena, 25th; Upper Mississippi Valley, 9th, 10th, 11th, 12th, 13th, 16th, 17th, 23d, 24th, 26th, 28th, 29th; Missouri Valley, Huron, Dak., 29th; Middle Slope, 2d, 25th, 29th; Southern Slope, Fort Davis, Tex., 20th; Rio Grande, Valley, 5th, 7th; Northern Plateau, Umatilla, 1st; North Pacific Coast region, Portland, 3d.

Mirage.—Indianola, 14th to 18th, 22d to 29th. Grand Haven, 20th, having the appearance of a city on the opposite side of the lake, outlines very distinct; the roofs of houses and church steeples were plainly discernible; phenomenon lasted about fifteen minutes. New Haven, 8th, 16th, 17th, on Faulkner's Island; spars and rigging of passing vessels towered to an unusual height.

MISCELLANEOUS PHENOMENA.

Polar bands.—Portland, Oreg., 5th, 6th, 8th; New Corydon, Ind., 1st, 4th, 10th, 15th, 16th, 23d, 24th; Clinton, Iowa, 17th; Fayette, Miss., 12th, 17th, 24th; Clear Creek, Nebr., 3d, 23d; Freehold, N. J., 14th, 25th; Albany, N. H., 4th.

Meteors.—Campo, Cal., 1st, 11th; Los Angeles, 23d, 8 p. m., seemingly about half the size of the full moon; passed slowly across the sky from SE. to SW., and bursted into a thousand brilliant particles resembling the explosion of a huge rocket. The sky was brightly illuminated during its passage. Boisé City, 10th, 15th, 26th. Yuma, 24th, 26th. Fort Cummings, 22d. Deadwood, 13th, very brilliant. Fort Shaw, 5th. Fort Keogh, 5th. Fort Assinniboine, 11th. Uvalde, 28th. Huron, Dak., 18th. Davenport, 13th, 14th, 21st, 22d, 23d. Buffalo, 9th. Columbus, 11th, 14th. Life-Saving Station, No. 6, N. C., 2d, 8th, 11th. New London, 10th, 11th. Fort Union, N. Mex., 26th. Princeton, Cal., 6th, very large and brilliant. Rio Vista, Cal., 9th, 19th, illuminating the heavens like a flash of lightning. Anna, Ill., 21st. Charleston, Ill., 12th, 15th, 17th, 18th, 25th, 28th. Swanwick, Ill., 4th, 5th, 6th, 16th, 28th. New Corydon, Ind., 5th. Vevay, Ind., 1st, 3d, 10th. Monticello, Iowa, 1st, 20th. Muscatine, Iowa, 24th. Topeka, Kans., 6th, 7th, 14th, 20th. Point Pleasant, La., 12th, 14th, 16th, 24th. Woodstock, Md., 8th, 24th, 25th, 26th. Rowe, Mass., 16th, 22d. Fall River, Mass., 11th, 22d. Fayette, Miss., 2d, 3d, 10th. Clear Creek, Nebr., 1st. Genoa, Nebr., 16th, 17th. Freehold, N. J., 11th, 14th. Vineland, N. J., 9th. Waterburgh, N. Y., 22d. Ellsworth, N. C., 13th. Jacksonburg, Ohio, 9th to 15th, 30th. Wooster, Ohio, 9th. Fallsington, Pa., 6th. Statesburgh, S. C., 2d, 3d, 6th, 8th, 10th, 11th, 12th, 15th, 17th, 20th, 22d, 23d, 24th, 29th, 30th, 31st. Austin, Tenn., 14th, 16th, 28th. Beloit, Wis., 4th, 11th, 21st, 28th.

Prairie and forest fires.—From Flint to Port Huron, Mich., 31st, fires raging in fields, forests, and swamps; in nearly every section of the State more or less damage has been done; along the lake shore north of Fort Gratiot the smoke was almost stifling, and in Port Huron for the past three days it has been so thick as to seriously interfere with business. Independence, Kans., 13th to 31st, raged with great fierceness. Fayette, Miss., 29th. Freehold, N. J., 21st to 31st; air filled with smoke for many miles. Atco, N. J., 26th, very extensive. Carson City, Nev., 13th to 16th. New Corydon, Ind., 22d, 23d. Fort Missoula, Mont., 21st to 24th. Dayton, Wash., 19th, 25th. Salt Lake City, 3d, in mountains southeast of city. Fort Custer, 18th to 28th. Fort Keogh, 10th to 24th. Fort Assinniboine, 22d to 28th. Superior City, Mont., 19th to 22d. Fort Gibson, 13th to 29th. Fort Griffin, 20th. Stockton, 25th, 26th, 27th. Fort Sill, 27th. Jacksborough, 22d to 28th. Clarksville, Tenn., 12th, heavy fires along the south side of the Cumberland River; large loss to fences, timber, and crops. Petoskey, Mich., 4th, woods along the C. and G. T. Railroad burning fearfully; city filled with offensive smoke. West Branch, Mich., 5th, forests on fire along the line of the Mackinaw division of the Michigan Central Railroad; 3,000 telegraph poles and 8,000 fence posts burned; all railroad communication cut off and thousands of dollars' worth of standing timber destroyed. Tuscola County, Mich., 11th, the damage by fires will reach many thousands of dollars; timber and fences met with wholesale destruction; in several instances farm buildings were destroyed, entailing heavy loss; in the northern townships several lives were lost. Emmet, Mich., 31st, heavy fires raging without abatement; farmers obliged to leave work and fight for the preservation of their homes. Pana, Ill., 31st, grass and fencing destroyed, incurring a large loss. Tuscola, Ill., 31st, extensive, loss to grain stacks and fencing, $3,000. Province of Ontario, Can., 31st, bush fires widely prevalent and causing great damage. Bay City, Mich., 5th, raging about the city in every direction; for a hundred miles to the north, fences, buildings, and timber destroyed in vast quantities; railroad travel stopped; city enveloped in dense smoke and the air filled with burned leaves and ashes. Clinton County, Ohio, 31st, much fencing and many hay and grain stacks destroyed. Eagle Pass, 19th; Brackettville, 26th; Little Rock, 17th; Escanaba, 1st; Oswego, 31st, very numerous; Morgantown, 28th, dense smoke from forest fires.

Earthquakes.—Santa Barbara, Cal., 30th, 7 p. m., two slight shocks; course of movement north to south; no destruction. Umatilla, Oreg., 9th, a volcanic eruption took place from the side of a mountain situated south of the South Fork of Clearwater River, about twenty miles east of Mount Idaho, and a column of fire and smoke was thrown upwards to a height of several hundred feet.

Sunsets.—The characteristics of the sky at sunset as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from 181 stations show 5,585 observations to have been made, of which 29 were reported doubtful; of the remainder, 5,556, or 85.0 per cent., were followed by the expected weather.

Sun spots.—The following record of observations, made by Mr. D. P. Todd, Assistant, has been forwarded by Prof. S. Newcomb, United States Navy, Superintendent, Nautical Almanac Office, Washington, D C.:

Date—August, 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
2, 7 a. m	3	10	2	15	3	10	8	40†	
3, 8 a. m	0	0	0	5	0	0	8	85†	
4, 8 a. m	0	0	2	8	0	0	5	25†	
5, 5 p. m	0	0	2	6	0	0	3	19	
6, 8 a. m	0	6	0	0	0	0	3	25	
8, 7 a. m	1	1	0	0	0	0	4	26	
9, 7 a. m	0	0	0	0	0	0	3	20	
10, 8 a. m	0	0	0	0	0	0	3	20	
11, 8 a. m	1	7	0	0	0	0	4	15	
13, 8 a. m	0	0	1	4	0	0	2	8	
14, 9 a. m	0	0	1	5	0	0	1	3	
15, 9 a. m	0	0	0	0	0	0	0	0	
16, 7 a. m	0	0	0	0	0	0	0	0	
17, 8 a. m	1	8	0	0	0	0	1	8	
21, 10 a. m......	1	6	....	....	....	....	1	6	
22, 7 a. m	1	4	0	0	0	0	2	10	
23, 9 a. m	1	25†	0	0	0	0	3	35†	
24, 3 p. m	0	15	0	0	0	0	2	50†	
25, 7 a. m	0	10	0	0	0	0	2	60†	
27, 8 a. m	1	20	0	0	0	0	3	80†	Many of the spots small.
28, 8 a. m	0	30†	0	0	0	0	3	110†	Many of the spots small.
29, 8 a. m	3	10†	0	0	2	5	6	120†	

†Approximated.

Faculæ were seen at the time of every observation.

Mr. D. Trowbridge, at Waterburgh, N. Y., reports as follows; 2d, 2 groups, 5 spots, 1 group near east margin appeared by rotation, faculæ in west; 3d, 2 groups (same as observed on 2d), 3 spots; 4th, 3 groups, 8 spots, one new faint group, 4 spots near east margin; 5th, 2 groups, 3 spots, 1 group disappeared by rotation; 6th, 2 groups (same as observed on 5th), 6 spots; 8th, 2 groups (same as observed on 6th), 5 spots; 10th, 2 groups (same as observed on 8th), 4 spots; 11th, 3 groups, 5 spots, 2 faint groups, new one gone out; 12th, 2 groups, 2 spots; 13th to 16th, none visible; 17th, 1 group, 2 spots north of middle of disk appeared since morning of 16th; 18th, 1 group (same as observed on 17th), 2 spots, somewhat brighter; 19th, 1 group (same as observed on 18th), 1 spot; 20th, 2 groups, 1 new, appeared by rotation, 2 spots; 23d, 2 groups, 7 spots, one fine new group, 5 spots, appeared by rotation; 24th, 2 groups (same as observed on 23d), 9 spots; 26th, 5 groups, 16 spots, one of the groups observed on the 24th has divided into 3, or 2 new groups have appeared; 1 faint spot near middle of disk has appeared since 24th: 27th, 5 groups, 17 spots, 1 group appeared by rotation; 28th, 4 groups, 16 spots, some changes since 24th; 29th, 4 groups, 15 spots, 1 new group, appeared by rotation; 30th, 7 groups, 2 of them new, 25 spots, 1 has appeared and 1 disappeared by rotation; 31st, 7 groups, 20 spots. Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports; sun spots were observed every day during the month, except on the 14th and 15th. The largest were seen on the 1st and 3d; they were most numerous from 25th to 31st.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l., Chief Signal Officer, U. S. A.

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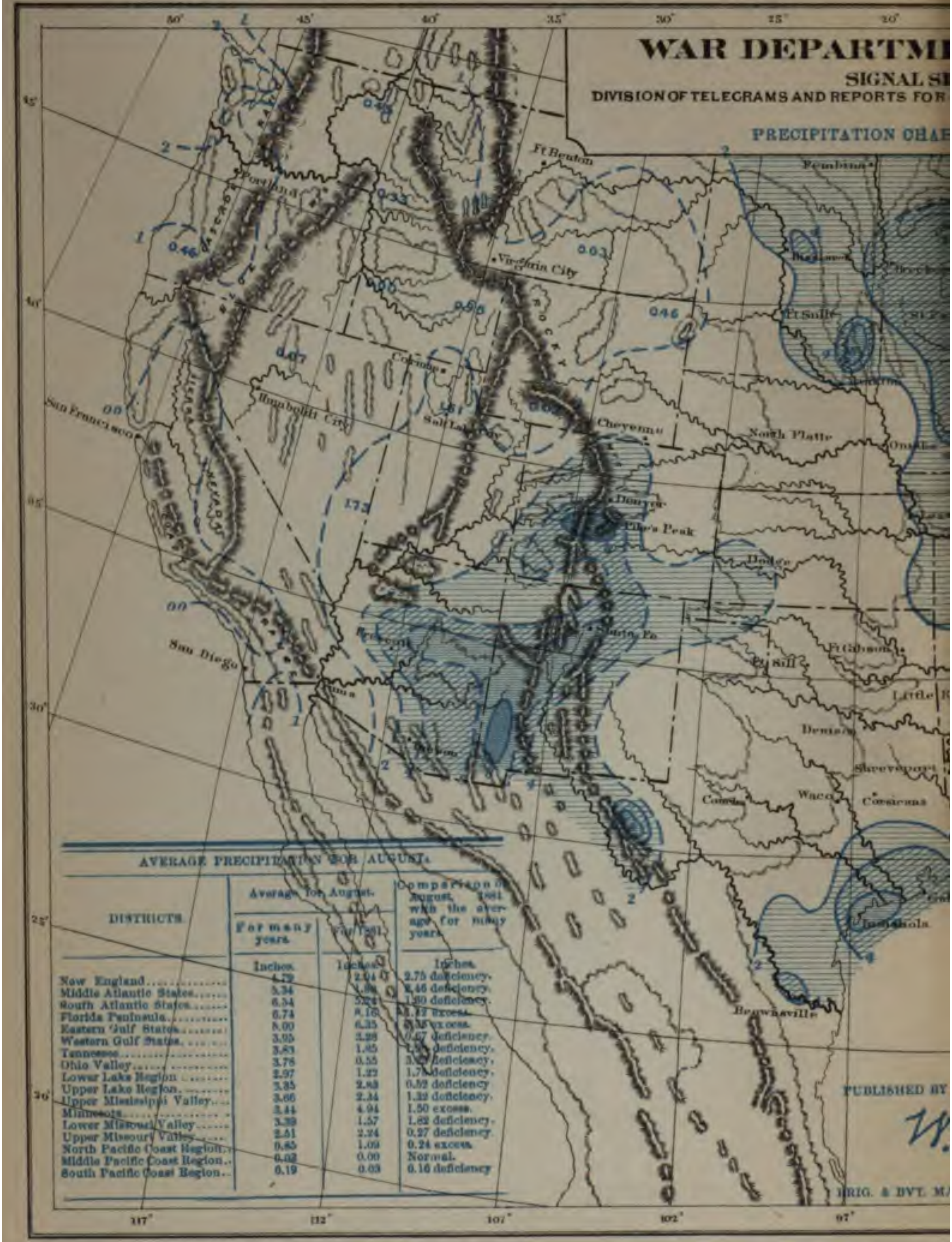

WAR DEPARTME

SIGNAL SE

DIVISION OF TELEGRAMS AND REPORTS FOR

PRECIPITATION CHAR

AVERAGE PRECIPITATION FOR AUGUST.

DISTRICTS.	Average for August.		Comparison of August, 1881, with the average for many years.
	For many years.	For 1881.	
	Inches.	Inches.	Inches.
New England	4.79	2.04	2.75 deficiency.
Middle Atlantic States	5.34	1.88	2.46 deficiency.
South Atlantic States	6.34	5.24	1.10 deficiency.
Florida Peninsula	6.74	8.16	1.42 excess.
Eastern Gulf States	5.00	6.35	1.35 excess.
Western Gulf States	3.95	3.28	0.67 deficiency.
Tennessee	3.83	1.85	1.98 deficiency.
Ohio Valley	3.78	0.55	3.23 deficiency.
Lower Lake Region	2.97	1.23	1.74 deficiency.
Upper Lake Region	3.35	2.83	0.52 deficiency
Upper Mississippi Valley	3.66	2.34	1.32 deficiency.
Minnesota	3.44	4.94	1.50 excess.
Lower Missouri Valley	3.39	1.57	1.82 deficiency.
Upper Missouri Valley	2.51	2.24	0.27 deficiency.
North Pacific Coast Region	0.85	1.09	0.24 excess.
Middle Pacific Coast Region	0.02	0.00	Normal.
South Pacific Coast Region	0.19	0.03	0.16 deficiency

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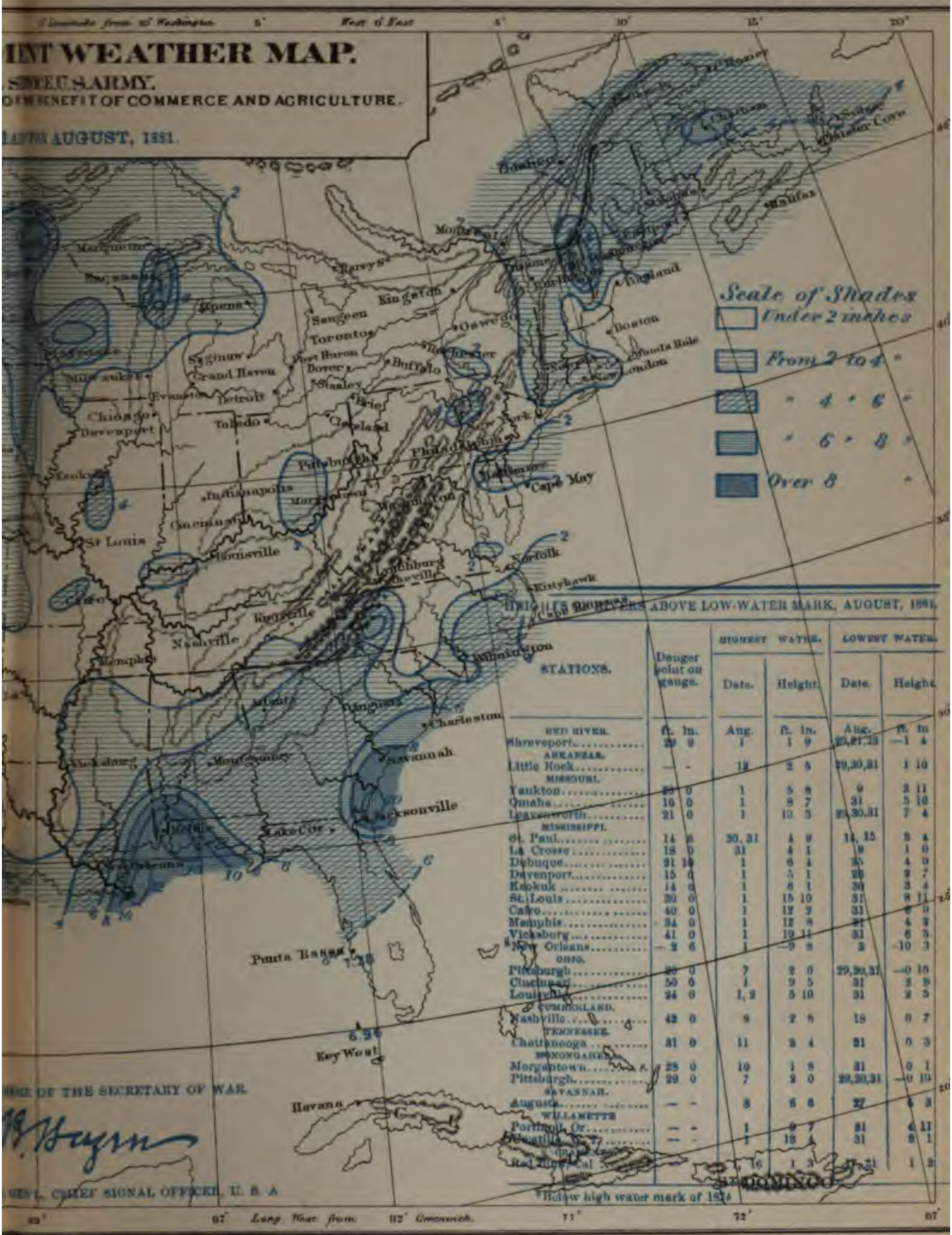
No. III.

IENT WEATHER MAP.

SERVICE U.S.ARMY.

O THE BENEFIT OF COMMERCE AND AGRICULTURE.

RING AUGUST, 1881.



Scale of Shades

☐	*Under 2 inches*
▤	*From 2 to 4 "*
▨	*" 4 " 6 "*
▦	*" 6 " 8 "*
■	*Over 8 "*

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, AUGUST, 1881.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER.		
			Date.	Height.		Date.	Height.	
RED RIVER.	ft.	in.	Aug.	ft.	in.	Aug.	ft.	in.
Shreveport	29	9	1	1	9	20,21,22	—1	4
ARKANSAS.								
Little Rock	—	-	12	2	5	29,30,31	1	10
MISSOURI.								
Yankton	20	0	1	5	8	9	3	11
Omaha	16	0	1	8	7	31	5	10
Leavenworth	21	0	1	10	3	29,30,31	7	4
MISSISSIPPI.								
St. Paul	14	6	30, 31	4	9	14, 15	3	4
La Crosse	18	0	31	4	1	9	1	0
Dubuque	21	10	1	6	4	25	4	0
Davenport	15	0	1	5	1	29	2	7
Keokuk	14	0	1	8	1	30	3	4
St. Louis	30	0	1	15	10	31	8	11
Cairo	40	0	1	12	2	31	6	0
Memphis	34	0	1	12	8	31	4	2
Vicksburg	41	0	1	19	11	31	6	3
*New Orleans	−2	6	1	—9	8	3	-10	3
OHIO.								
Pittsburgh	29	0	7	2	0	29,30,31	—0	10
Cincinnati	50	0	1	9	5	31	2	9
Louisville	24	0	1, 2	5	10	31	2	5
CUMBERLAND.								
Nashville	42	0	8	2	8	18	0	7
TENNESSEE.								
Chattanooga	31	0	11	3	4	31	0	3
MONONGAHELA.								
Morgantown	28	0	10	1	8	31	0	1
Pittsburgh	29	0	7	2	0	29,30,31	—0	10
SAVANNAH.								
Augusta	—	-	8	6	6	27	4	3
WILLAMETTE.								
Portland, Or.	—	-	1	9	7	31	4	11
Umatilla, W. T.	—	-	1	18	4	31	8	1
SACRAMENTO.								
Red Bluff, Cal.			[illegible], 16	1	3	[illegible], 31	1	2

*Below high water mark of 1874.

DER OF THE SECRETARY OF WAR.

B Hazen

GEN'L, CHIEF SIGNAL OFFICER, U. S. A

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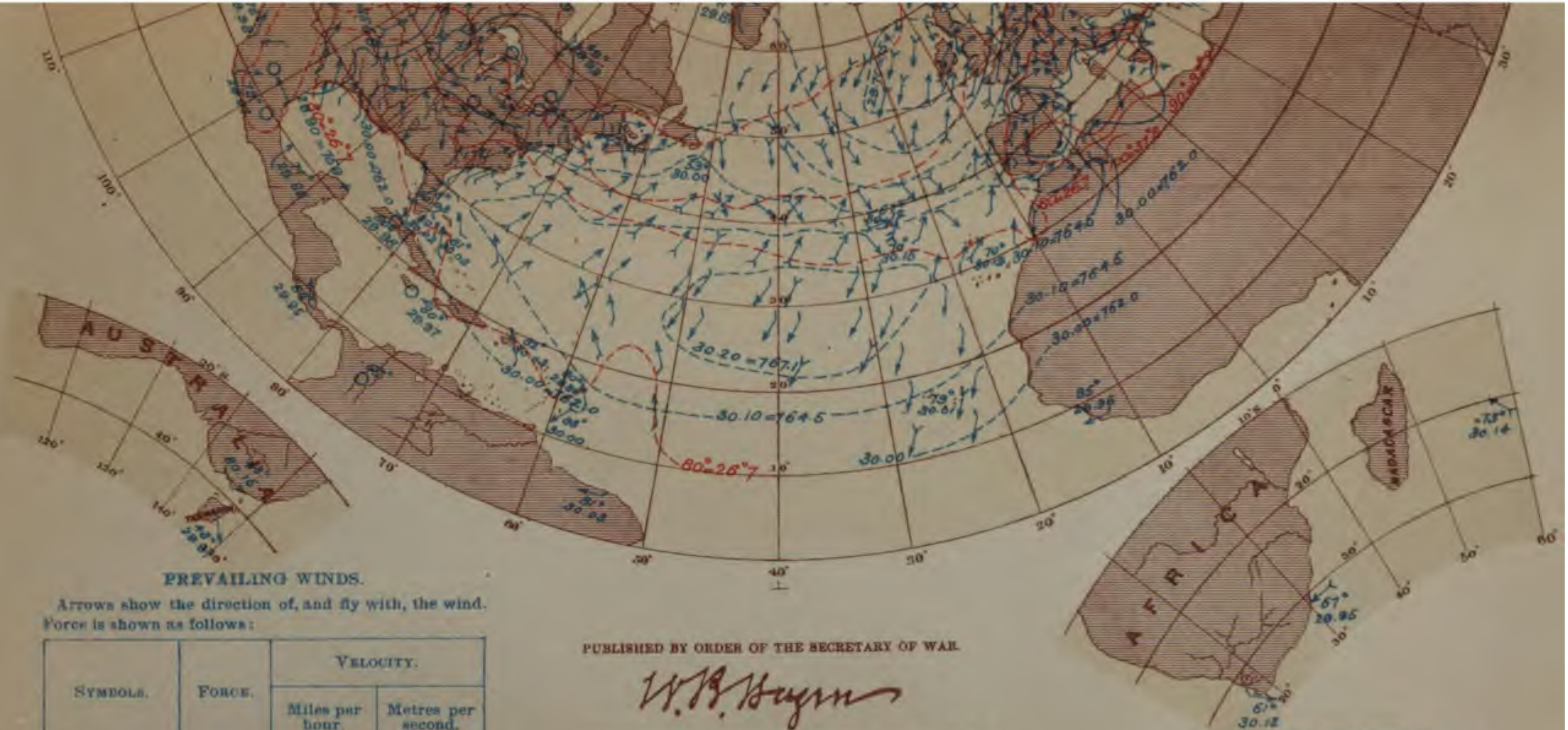


PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind. Force is shown as follows:

Symbols.	Force.	Velocity.	
		Miles per hour.	Metres per second.
○	0	0	0
→	1, 2	0 to 9.	0 to 4.0
→	3, 4	9.1 to 22.5	4.1 to 10.1
→	5, 6	22.6 to 40.5	10.1 to 18.1
→	7, 8	40.6 to 67.5	18.1 to 30.2
→	9, 10	67.6 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

ISOBARS AND ISOTHERMS.

Isobars in *blue*; detached barometer means in English inches.

Isotherms in *red*; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.

INTERNATIONAL MONTHLY CHART.

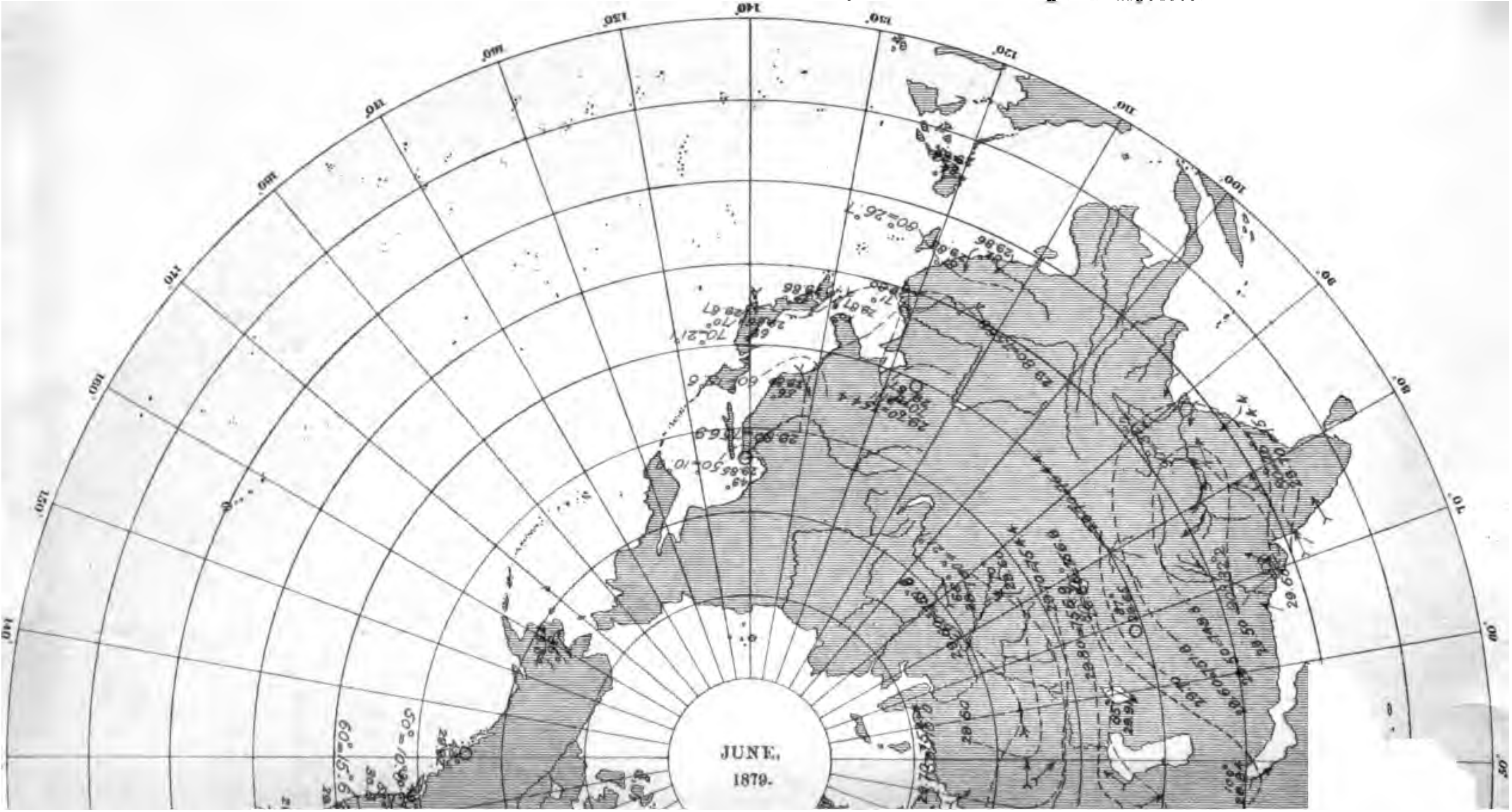
Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of June, 1879, based on the daily charts of the International Bulletin

No. V

Office of the Chief Signal Officer.

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.



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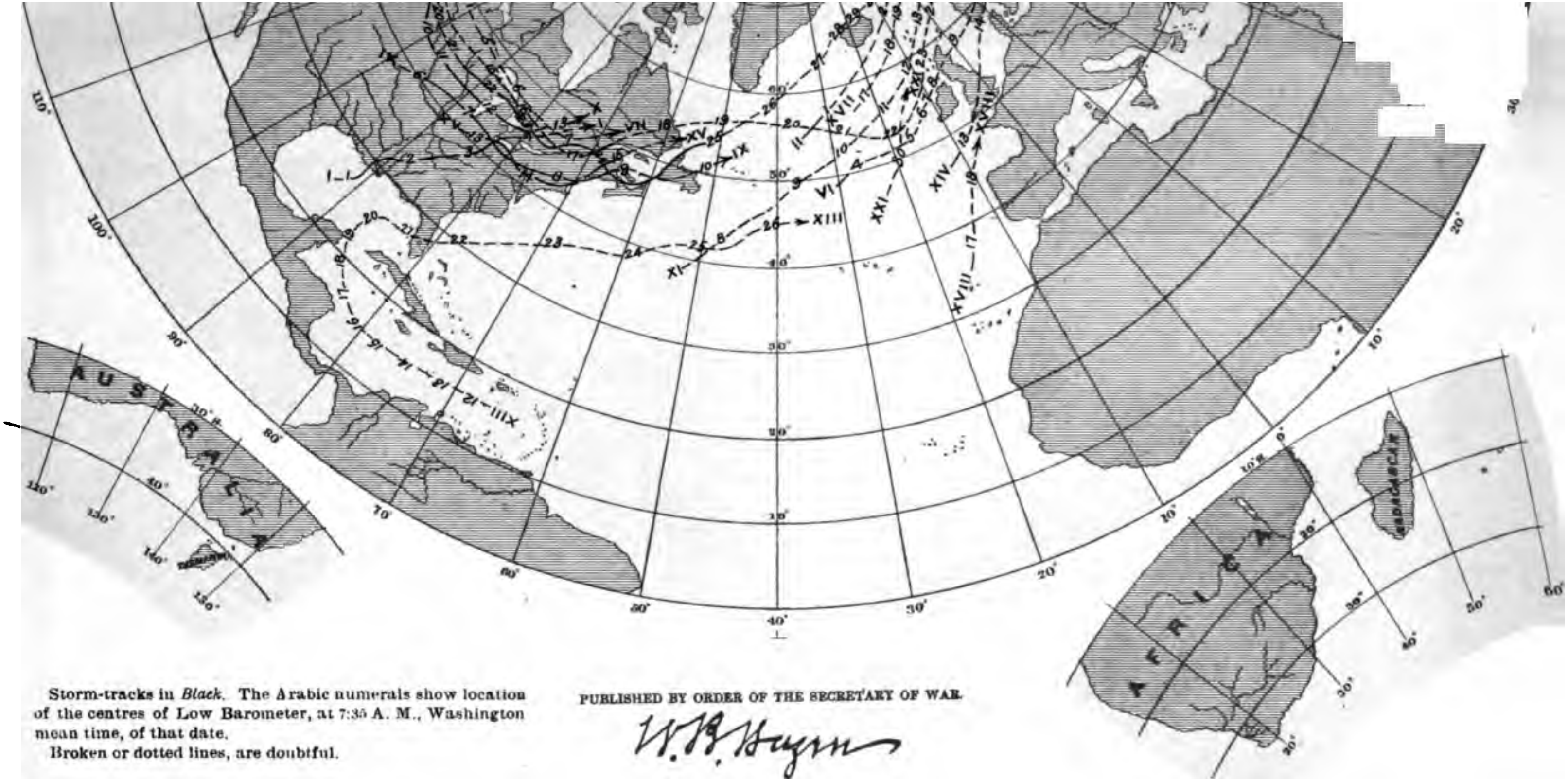


Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Broken or dotted lines, are doubtful.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL CHART.

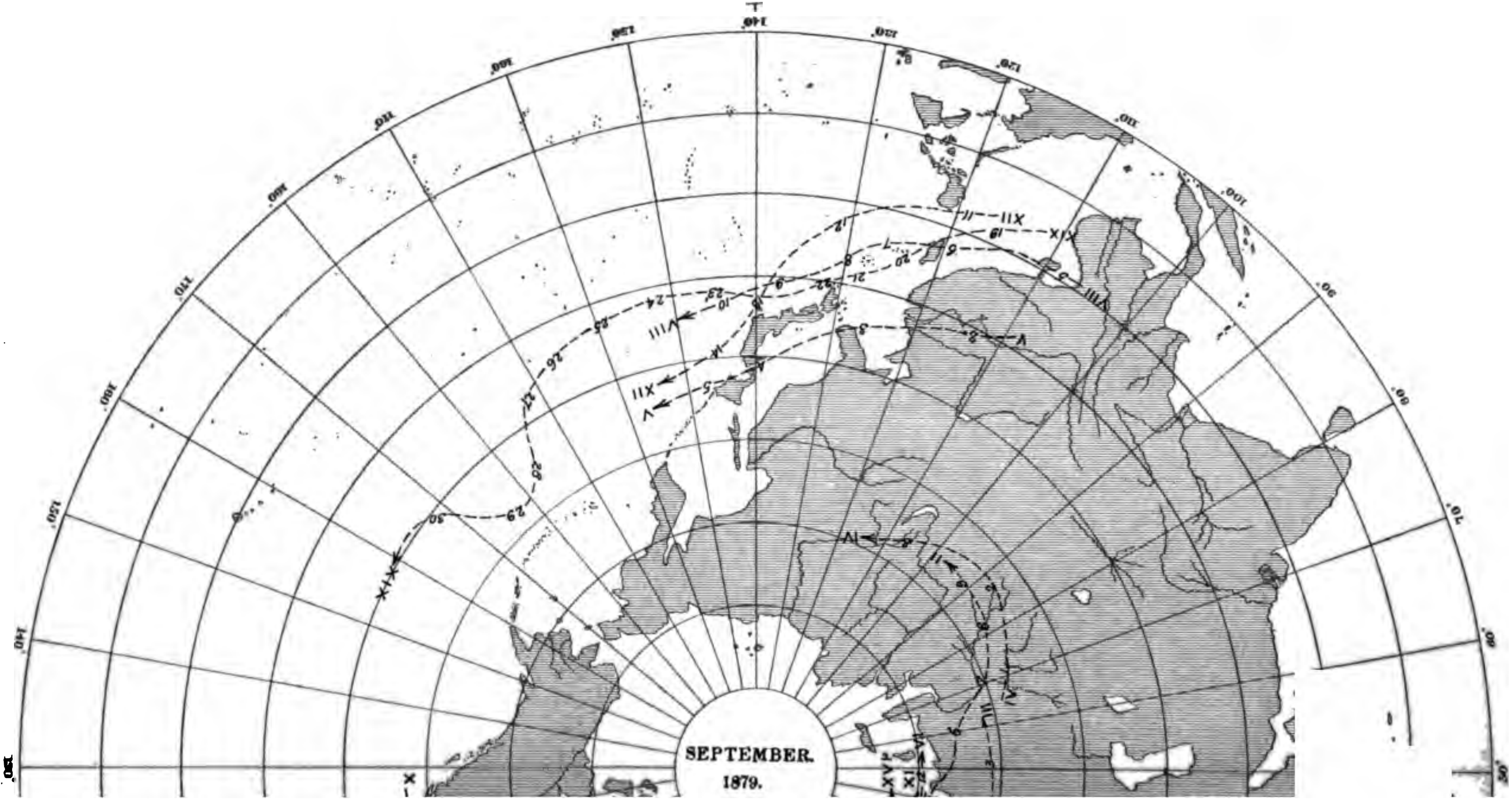
Showing Tracks of Centres of Low Barometer for September, 1879.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. VI.



APPENDIX No. 78.

MONTHLY WEATHER REVIEW, SEPTEMBER, 1881.

INTRODUCTION.

In preparing this Review the following data, received up to October 20, have been used, viz, the regular tri-daily weather charts, containing the data of simultaneous observations taken at 131 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 195 monthly journals and 166 monthly means from the former, and 15 monthly means from the latter; 216 monthly registers from voluntary observers; 56 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of September, 1881, is shown by isobaric lines (in black) upon Chart No. II. The area of lowest pressure covers the nothern portions of the Upper Mississippi and Missouri Valleys, in which regions the greatest departures from the normal for the month occur; within this territory the pressure ranges from 29.87 to 29.93. An area of 29.90 prevails over California, mean pressure ranging from 29.84 to 29.92. The area of highest mean pressure embraces the central and western portions of the South Atlantic States, extending thence northeastward along the Middle Atlantic, New England, and Nova Scotia coasts; barometer ranging from 30.08 to 30.16. Compared with the preceding month the pressure is everywhere higher, by from 0.02 to 0.15 inch, except in the Upper Mississippi and Missouri Valleys, and in California, where the fall is from 0.01 to 0.10 inch.

Departures from the normal values for the month.—Compared with the means for previous years the mean pressure of the present month is everywhere below the normal, from 0.01 to 0.18 inch, except at scattering stations along the Atlantic coast where the excess ranges from 0.01 to 0.09 inch. The regions of greatest deficiency are found in the Upper Mississippi and Missouri Valleys and in the Southern Pacific Coast region. Stations reporting a normal condition are as follows: Key West, Baltimore, Philadelphia, Washington, and Knoxville; those reporting a departure of but 0.01 inch: Charleston, Norfolk, Montgomery, Wilmington, Savannah, Augusta, Atlanta, Cincinnati, Buffalo, Detroit, Galveston, Shreveport, Red Bluff, and Pioche.

Barometric ranges.—The range of pressure for the month has generally varied from 0.5 to 0.7 inch, and in the extremes from 0.23 inch at Key West to 1.03 and 1.09 inches at Wilmington and Smithville, respectively. Throughout the several districts the monthly barometric range varied as follows: New England, 0.52 inch on summit of Mount Washington to 0.84 inch at Eastport; Middle Atlantic States, 0.39 at Cape May to 0.6 at Albany; South Atlantic States, 0.34 at Cedar Keys to 1.03 at Wilmington and 1.09 at Smithville; Eastern Gulf States, 0.23 at Key West to 0.56 at Montgomery; Western Gulf States, 0.39 at Indianola to 0.55 at Mason; Rio Grande Valley, 0.36 at Brownsville to 0.45 at Brackettville; Ohio Valley and Tennessee, 0.37 at Pittsburgh to 0.84 at Indianapolis; Lower Lake region, 0.44 at Oswego to 0.63 at Toledo; Upper Lake region, 0.55 at Port Huron to 0.9 at Marquette and 1.05 at Duluth; extreme Northwest, 0.85 at Bismarck to 1.00 at Saint Vincent; Upper Mississippi Valley, 0.57 at Keokuk to 0.95 at Saint Paul; Missouri Valley, 0.63 at Leavenworth to 0.91 at Yankton and 0.92 at Huron, Dak.; Northern Slope, 0.66 at Cheyenne to 0.84 at Fort Keogh; Middle Slope, 0.52 at Fort Elliott to 0.75 at Dodge City; Southern Slope, 0.48 at Jacksborough to 0.66 at Fort Griffin; Northern Plateau, 0.56 at Dayton to 0.74 at Missoula; Middle Plateau, 0.51 at Winnemucca to 0.58 at Salt Lake City; Southern Plateau, 0.4 at Silver City to 0.63 at Phœnix; North Pacific coast, 0.47 at Roseburg to 0.64 at Olympia; Middle Pacific coast, 0.47 at Red Bluff to 0.55 at Sacramento; Southern Pacific coast, 0.26 at Campo to 0.51 at Yuma.

Areas of high barometer.—There was a general deficiency in pressure for the month, the most marked being in the Northwest. This distribution of pressure was associated with the southerly winds which prevailed for the month and with the unusually high temperature, which will hereafter be more fully described. Only four areas of high barometer were sufficiently marked to merit description.

No. I.—On the 4th, although the pressure continued below the mean there was a general rise of barometer in the Atlantic and Gulf States. The rise on the 5th was confined to the South Atlantic and Gulf coast. On the 6th and 7th the pressure was, in general, above the mean east of the Rocky Mountains. On the 8th the region of high barometer was transferred to northwestern Texas and New Mexico. During the régime of this high pressure fair weather prevailed in the Middle, South Atlantic, and East Gulf States, and in Tennessee and the Ohio Valley.

No. II.—On the 13th there was a marked rise in pressure on the Pacific Slope which, on the 14th, extended over Idaho, Montana, and Dakota, the barometer in Montana averaging 0.3 inches above the mean for the month. On the 15th this area remained nearly stationary in position while low area No. IV was moving up the Mississippi Valley. On the 16th it disappeared before the advance of this storm into Minnesota.

No. III.—During the progress of low area No. IV there was, on the 14th and 15th, a marked barometric rise in the maritime provinces of Canada and in New England. The pressure remained high until the 18th, and with slight change of location. The highest barometers reported were at the morning report of the 16th: Chatham, 30.60, or one-half inch above the normal; Sydney, 30.57; Halifax, 30.56; Eastport, 30.54. On the 15th and 16th the pressure in this region averaged more than 0.4 inch above the mean for the month.

No. IV.—On the 27th the barometer rose above the mean in the Missouri Valley. On the 28th the rise extended eastward to the Saint Lawrence Valley. On the 29th, during the passage of low area No. VII over the Northwest, the pressure rose in New England and Nova Scotia, the highest barometers being: Eastport, 30.40; Halifax, 30.47, and Sydney, 30.46. On the 30th, with diminishing pressure, the center of the high area was transferred to Virginia and North Carolina, while low area No. VII moved towards Hudson's Bay.

Areas of low barometer.—Seven such areas have been chartered. The month is remarkable for the few storms of any energy which have affected the Atlantic coast of the United States. In the Lake region two storms (low areas Nos. II and VII) exhibited great energy. Low area No. VI is remarkable for the anomalous track pursued at different parts of its course.

No. I.—On the 4th a great depression which had developed east of the Rocky Mountains moved over the Northwest. The lowest barometers reported were Yankton and Fort Bennett, 29.43 or 0.6 inch below the mean, Duluth, 29.28 or 0.71 inch below the mean. On the 5th the storm center pursued an easterly track north of the Lake region, and on the 6th disappeared beyond the Gulf of Saint Lawrence. During the passage of the depression no rain fell in front or south of the storm center, but general precipitation was reported in the Northwest and Upper Lakes, after which the warm southerly winds veered to colder northwesterly. The maximum temperatures of the month, east of the Rocky Mountains, are associated with the march of this low area. The highest reported temperature was in Washington City, 104.° Cautionary signals were displayed in advance of this storm on the 4th on Lakes Superior, Michigan, and Huron. The following maximum velocities were reported: Milwaukee, 30 S.; Grand Haven, 54 SW.; Port Huron, 25 W.

No. II.—On the 8th a depression moved to the eastward over Idaho and Montana, and on the 9th advanced beyond Dakota into Minnesota. On the 10th the storm center passed over Lake Superior and into the Province of Ontario. On the 11th the low area moved beyond the Gulf of Saint Lawrence. During the march of the storm center there were no specially low barometric readings, nor was the barometric gradient at any time especially noteworthy, but the passage of the center of low area was marked by very sharp falls of pressure followed at the subsequent observation by sharp rises. These sudden changes were accompanied by remarkably high winds for the Lake region. Cautionary signals were ordered to be displayed on the 10th for all the Lakes. They were generally justified by the following maximum velocities: Marquette, 35 W.; Escanaba, 25 SW.; Milwaukee, 38 SW.; Chicago, 25 W.; Grand Haven, 44 W.; Alpena, 26 W.; Port Huron, 27 W.; Toledo, 30 SW.; Sandusky, 44 W.; Erie, 27 W.; Buffalo, 28 SW. The precipitation of this storm was confined to the Northwest, Lake region, and New England.

No. III.—At the morning report of the 9th a sharp fall in pressure and the circulation of the winds showed the existence of a storm center menacing the North Carolina coast; during the day a depression of great energy but of very slight diameter moved in a northerly track toward Norfolk. On the 10th, curving slightly to the northeast the storm passed beyond the coast. Cautionary signals were ordered in advance of this storm on the 9th from Smithville to Sandy Hook, and were justified by the following maximum velocities: Smithville, 60 NE.; Wilmington, 64 W.; Macon, 50 SW.; Hatteras, 42 SW.; Kitty

Hawk, 40 S.; Cape Henry, 35 SE.; Norfolk, 25 SE.; Chincoteague, 32 SE.; Barnegat, 28 N.; Sandy Hook, 30 NE.

No. IV.—This storm, which pursued a very anomalous track, was first evident in Texas, where on the 14th it moved in a track nearly due east. At the midnight observation, while the storm center was near New Orleans, a barometric depression extended from the Gulf of Mexico to the Lake Superior region. At the same time the high pressure No. III, before described, prevailed with fair weather in New England. These conditions were unfavorable to an eastern progress of the storm, and on the 15th the depression moved in a northerly course to Lake Michigan. At the end of this day the pressure had not yielded in New England, and had begun to fall in the Northwest, the lowest barometers reported were, Chicago, 29.42; Grand Haven, 29.44; Milwaukee, 29.36, all more than 0.6 inch below the normal. On the 16th, with diminishing energy, the storm center moved into Iowa and Minnesota, and on the 17th into Manitoba. The track on the 16th and 17th is very remarkable, and probably for a storm of such energy has no parallel in the history of the Signal Service. Cautionary signals were displayed on the 14th from Indianola to Pensacola, and on Lakes Michigan, Superior, and Huron, and on the 15th on Lakes Erie and Ontario. The following maximum velocities were reported: Indianola, 40 N.; Galveston, 28 N.; Port Eads, 28 S.; Pensacola, 38 S.; Mobile, 28 SE.; Duluth, 78 NE.; Marquette, 30 S.; Milwaukee, 38 SW.; Grand Haven, 30 SE.; Alpena, 26 W.; Port Huron, 27 W.; Detroit, 39 SE.; Sandusky, 30 SW.; Cleveland, 26 SE.; Erie, 37 SE.; Rochester, 35 E.

No. V.—On the 23d, a depression exhibiting slight energy moved across Dakota into Minnesota. On the 24th, turning more to the north of east it moved with increased energy beyond the Lake Superior region. Nearly all the rain accompanying this storm was confined to the Northwest and the Upper Lake region. Cautionary signals were in general justified by the following maximum velocities: Duluth, 25 SW.; Marquette, 26 S.; Milwaukee, 34 SW.; Chicago, 27 SW.; Grand Haven, 33 SE.; Alpena, 36 S.; Port Huron, 27 S.; Detroit, 28 SW.; Toledo, 31 SE.; Sandusky, 32 SW.; Cleveland, 28 S.

No. VI.—On the 25th, a depression developed in Wyoming and Nebraska. On the 26th, the low area, showing but slight energy, moved into Wisconsin. On the 27th, it advanced to the eastward beyond the lakes, and on the 28th it disappeared beyond the Gulf of Saint Lawrence. At no portion of its track did it become a storm of any violence. Its passage was accompanied by light rainfall, which extended to New England.

No. VII.—On the 28th, a low area developed in Dakota, which, on the 29th, moved in a northeasterly track across Minnesota. South of the track of the center of depression there were sharp barometric gradients and considerable storm energy. The lowest pressures reported were: Omaha, 29.42; Fort Bennett, 29.38; Moorhead, 29.4; Saint Paul, 29.46; Duluth, 29.3—all more than 0.6 inch below the mean. Cautionary signals, which had been ordered for the previous storm (No. VI), were kept displayed in consequence of danger menaced by the appearance of the new storm center.

INTERNATIONAL METEOROLOGY.

International Charts Nos. V and VI accompany the present Review. The former is published for July, 1879, and continues the series of this chart commenced in January, 1877. Chart No. VI is prepared for the month of October, 1879, and continues the series of this chart commenced in November, 1877.

Chart No. V shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of July, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. To the areas of low pressure for the present month there attaches considerable interest, owing to their strikingly irregular boundaries over northern Europe. It will be observed, upon examination of the chart, that the lowest mean pressures are to be found over northern Hindostan, as indicated by the isobar of 29.50. Thence northward over the Himalayas and the western portion of the Chinese Empire the barometer rises to 29.60, and north of Toorkistan and the Province of Tomsk, comprising the valley of the Obi and its tributaries, the pressure again rises to 29.70. Northwest of this locality, and within very narrow and irregular limits, the area of 29.70 passes over central Russia, southern Scandinavia, and the northern portion of the British Isles. Between the meridians of 10° E. and 10° W., two small areas of 29.60 appear, one over the Shetland Islands and the other over the Hebrides. The area of 29.70 probably reaches the Asiatic Coast in the vicinity of Pekin, but from lack of reports from central and eastern Siberia the lines on the coast cannot be connected with those of the interior. In Manitoba and along the southern shores of Hudson's Bay the barometer falls to near 29.80, and in one instance to 29.78 at Pembina, Dak. Over the United States, west of the 100th meridian, the pressure is generally above 30.00; to the eastward and north of the 40th parallel, including Texas and Indian Territory, the barometer averages about 29.95. Between the parallels of 50° and 60° N., the pressure ranges from 29.55 to 29.95, and from 60° to 70° N., from 29.55 to 29.91. Over Asiatic Turkey and Persia, it falls below 29.80, with probably an area of 29.70 over Arabia. Over Hindostan the pressure ranges from 29.41 at Lahore to 29.71 at Poonah. The area of highest pressure, 30.30, covers the ocean between 30° and 40° N., and 20° and 50° W. The area of 30.10 occupies about three-fourths of the ocean between the parallels of 20° and 50° N., and the meridians of 10° and 70° W. The area of 30.00 occupies the southeastern portion of the United States and the extreme southwestern portion of Europe; the barometer over the latter being generally below 29.90. The following are the highest readings from isolated stations: Angra, 30.33 (770.3); Ponta, Delgado, 30.31 (769.8); Capetown, 30.16 (766.0); Funchal, 30.14 (765.5); Mauritius and Melbourne, 30.13 (765.2); Mexico, 30.10 (764.4). The extreme monthly range of mean pressure is 0.94 inch, which is 0.03 inch smaller than July, 1878, and 0.02 inch larger than July, 1877. The following monthly mean temperatures are given in Fahrenheit's scale: Lowest Godthaab, 44°; Fort St. Michaels, 47°; Stykkisholm, 51°; York Factory, 55°; Nikolaievsk on the Amoor and Moose Factory, 60°; highest, Lahore, 99°; Laghouat, 98°.1; Nukuss, 90°.7; Tiflis and Tashkend, 90°.5; Beirut, 90°. The prevailing direction of the winds over the United States was southwesterly in the Atlantic Coast States, southerly over the interior and in the Plateau regions, westerly in the Northwest and Lake region, and variable on the Pacific Coast. Over the Atlantic Ocean, northeast to southeast and southwest south of parallel 40° N., and to the northward from southwest to northwest. Over Europe, northerly in Scandinavia, northwest to southwest over the British Isles, westerly in the interior, and north to west in Italy. In Algeria, variable. In Hindostan, southwest to northwest. Along the Asiatic coast, southeast to southwest. Compared with July, 1877 and 1878, the temperature over the United States agrees very closely in the interior, but is somewhat lower along the northern boundary, in the Southern Plateau and Southern Pacific Coast regions, and higher along the Gulf coast. The pressure is slightly higher to the south and east and in the Lake region and Northwest, elsewhere about normal. Over the Atlantic Ocean where comparison can only be made with 1878, the pressure at the central area of high (in the vicinity of the Azores) is from 0.01 to 0.03 inch higher. The area of 30.10 has moved considerably to the southeast, causing a marked fall along the western coasts of France and the Britsh Isles, and over the Bay of Biscay. Off the eastern coast of the United States, the changes in temperature and barometer are very slight. North of parallel 50° there is a marked rise in the barometer west of 30° W., but a decided fall to the eastward. With regard to temperature the changes are unimportant except in the last-named locality, where there occurred a fall of from 3° to 5°. In Europe the greatest changes in pressure occur in the central and southern portions and over the British Isles, where in the latter a decided fall is reported of from 0.05 to 0.30 inch. This deficiency extends southward over Algeria, and eastward through Russia to central Siberia; thence to the Asiatic coast, there was first a rise and then a fall, the latter occurring along the China coast. Accompanying this general diminution of pressure there is a considerable rise in temperature, except over the British Isles, where a fall of from 2° to 4° occurs. In Hindostan there is a general but slight fall in pressure, accompanied by a corresponding rise in temperature. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of July, 1879, as compared with the means of the past two years:

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.		
	July, 1877-'78.	July, 1879.	Departure.	July, 1877-'78.	July, 1879.	Departure.
	°	°	°			
York Factory	58.2	54.6	−3.6	29.75	29.90	+0.15
Fort St. Michaels	49.1	47.2	−1.9	29.82	29.86	+0.04
Godthaab	44.2	44.1	−0.1	29.74	29.91	+0.17
Stykkisholm	51.7	51.1	−0.6	29.73	29.86	+0.13
Tromso	53.9	56.1	+1.2	29.73	29.78	+0.05
Thorshavn	54.6	53.1	−1.5	29.76	29.74	−0.02
Archangel	61.3	59.7	−1.6	29.97	29.72	−0.25
Ekaterinburg	71.1	70.9	−0.2	29.66	29.63	−0.03
Barnaul	70.0	79.5	+9.5	29.65	29.59	−0.06
Yeniseisk	70.4	76.8	+6.4	29.58	29.70	+0.12
Nikolaievsk, on the Amoor	57.5	59.7	+2.2			

Comparative thermometric and barometric means, with corresponding departures—Continued.

Station.	Mean temperature.			Mean barometer.		
	July, 1877-'78.	July, 1879.	Departure.	July, 1877-'78.	July, 1879.	Departure.
	°	°	°			
Pekin	81.8	78.8	−3.2	29.65	29.64	−0.01
Zi-Ka-Wei	77.6	80.8	+3.2	29.75	29.71	−0.04
Tokei	77.1	76.3	−0.8	29.87	29.90	+0.03
Tashkend	86.9	90.5	+3.6	29.78	29.60	−0.18
Nukuss	89.9	90.7	+0.8	29.76	29.75	−0.01
Beirut	89.6	90.3	+0.7	29.78	29.73	−0.05
Mauritius	71.7	72.1	+0.4	30.18	30.13	−0.05
Fort Napier	69.6	63.7	−5.9	30.01	30.01	Normal.
Cape Town	61.0	61.4	+0.4	30.12	30.16	+0.04
Free Town	81.4	79.7	−1.7	30.02	29.98	−0.04
Paramaribo	82.9	79.8	−2.1	30.03	30.02	−0.01
Funchal	74.4	74.8	+0.4	30.16	30.14	−0.02
Ponta Delgado	74.4	76.6	+2.2	30.34	30.31	−0.03
Angra	72.4	74.3	+1.9	30.33	30.33	Normal.
Bridgetown	83.0	81.2	−1.8	29.99	29.98	−0.01
Navassa	82.7	81.3	−1.4	29.92	29.98	+0.06
Medellin	67.4	66.1	−1.3	....	....	....
San José de Costa Rica	66.2	66.7	+0.5	....	....	....
Mexico	59.3	56.3	−2.0	30.10	30.06	−0.04
Melbourne	48.6	46.8	−1.8	30.15	30.13	−0.02
Hobart Town	51.8	42.	−9.5	29.95	29.98	+0.03
San José de Puerto Rica	82.8	83.	+0.3	29.98	30.05	+0.07
Nassau	83.8	84.0	+0.2	30.03	30.06	+0.03
Havana	82.5	82.5	Normal.	30.02	30.04	+0.02
Astrakhan	85.2	87.8	+2.6	29.79	29.79	Normal.
Athens	87.7	89.	+1.9	29.90	29.84	−0.06
Lahore	97.4	99.	+1.7	29.44	29.41	−0.03
Tiflis	88.4	90.5	+2.1	29.75	29.74	−0.01
Laghouat	97.9	98.1	+0.2	30.10	29.98	−0.12
Monach Light-house	58.9	54.	−4.7	29.85	29.55	−0.30
Fort de France	80.8	79.	−1.1	29.89	29.86	−0.03
Yokohama	77.4	76.	−0.7	29.83	29.90	+0.07
Lisbon	77.0	75.0	−2.0	30.07	30.10	+0.03
Madrid	88.3	90.	−1.8	29.94	29.89	−0.05
Cagliari	82.	79.0	−3.9	29.96	29.98	+0.02

Chart No. VI.—This chart displays the tracings of the probable courses of twenty-three of the principal storm areas of the Northern Hemisphere for the month of October, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from logs of vessels of the merchant marine of the North Atlantic Ocean. Concerning the general distribution of the paths of the areas of low barometer the following is given: Only three areas were confined within the boundaries of North America, although six others crossed portions of that continent, two coming from the Pacific, two from the Atlantic, one from the Rocky Mountain region between the parallels of 40° and 50° N., and one from Manitoba, the latter crossing the ocean to the mainland of Europe. Three areas were confined to the Atlantic between the 30th and 50th parallels. Seven areas reached the mainland of northern Europe from the Atlantic between the parallels 60° and 70° N. Two areas were confined to Southern Europe, one to the Bay of Biscay and northern Spain and one to southern Russia. Of the storms of North America the following descriptions are given:

No. I formed over the northern Rocky Mountain region on the 1st and moved thence northeastward during the day to Lake Superior, accompanied by brisk south to west winds and light rains. During that portion of the storm's course eastward over Canada and the maritime provinces, fresh to brisk winds were experienced, with the center of depression moving very rapidly and accompanied by slight precipitation. By morning of the 4th the depression, with considerably diminished energy, had reached the Atlantic in the vicinity of 50° N., 50° W., followed over the maritime provinces by brisk to high westerly winds and rapidly rising pressure. On this and the preceding day there began the formation of an area of barometric minima over the ocean between the parallels of 40° and 50° N. and the meridians of 30° and 60° W., which continued about stationary until the 29th; 4th, in 47° 30′ N., 45° W., 29.73, W. force 6, on the Banks of

Newfoundland; steamship Alabama took heavy northerly gales which lasted until the 12th; in 50° 46′ N., 26° 08′ W., WSW., S. and NW. fresh to strong gales and high sea; in 49° 05′ N., 27° 09′ W., S. and NW., strong gales. 5th, in 50° 18′ N., 32° 13′ W., NNW. to WSW., fresh gales to moderate breezes, high seas; in 44° 50′ N., 42° 50′ W., strong SW gales; in 45° 35′ N., 50° 10′ W., 29.83, NNW., force 8, rain. 6th, in 46° 38′ N., 39° 44′ W., SW. to NW., fresh to strong gales, clearing away at 8 p. m.; in 51° 10′ N., 31° 36′ W., fresh to moderate S. to SE. gales, with rain. 7th, in 48° 36′ N., 33° 20′ W., strong SE. gales with hard squalls, torrents of rain and heavy seas sweeping decks; in 51° N., 37° W., 29.80, S., force 3, rain. Area No. V, to be described further on, is in all probability a continuation of this storm. No. III.—After the passage of area No. I to the Lake Superior region the barometer again fell over Montana and Wyoming, developing on the 3d an area of slight energy which moved rapidly northeastward to Manitoba, where on the morning of the 4th the lowest barometer, 29.64, occurred at Fort Garry. On the 5th this area gradually filled up over Hudson's Bay. No. IV.—This area first appeared over the Pacific Ocean on the 3d in the vicinity of 44° N., 140° W., and moving thence slowly eastward, reaching the coast of Oregon and Washington Territory on the morning of the 6th; Olympia, 29.43, S., rain; Portland and Roseburg, 29.45, SSE. and SE., cloudy. During the day the depression moved southeastward and on the following morning was central between Virginia City, Montana, and Salt Lake City; barometer at former 29.33, wind NW., at latter 29.55, S. Morning of the 8th, central with lower pressure in the Middle Rocky Mountain slope; North Platte, 29.22, SE.; Dodge City, 29.36, S.; Cheyenne, 29.76, NW.; Denver, 29.73, NE. With increased energy the depression moved northward to Manitoba, where on the morning of the 9th the lowest barometer, 29.44, was reported from Fort Garry; rain, with fresh to brisk winds, prevailed along the northern border of the country eastward from the 100th meridian to the Pacific coast. On this morning a barometric trough extended southward from Manitoba to the Rio Grande Valley, with the lowest reading at North Platte, 29.29, wind NNW. High winds were experienced at Rocky Mountain stations as follows: Pike's Peak, SW. 78 miles; Cheyenne, W. 50 miles. During the 9th the pressure rapidly recovered to the south and west, and on the morning of the 10th the center of depression lay to the north of Manitoba, where during the day it disappeared over Hudson's Bay. No. IX.—With a very sudden and rapid fall in the barometer, this depression appeared on the Oregon coast on the morning of the 11th. During the two following days the area passed southeastward into northern New Mexico, followed over Nevada by cold northwesterly winds and light snow at places. On the 14th the depression curved to the north-northeast, being central in Colorado on the following morning with a decided fall in pressure. By morning of the 16th, was central in the Upper Missouri Valley from whence its course changed to the east-southeast, uniting with area No. VIII on the 17th in central Wisconsin. Accompanying this combination there was in consequence no marked change in the barometer or coincident increase of wind velocity. The central area still remained within the isobar of 29.60, and light rains, with fresh to brisk winds, prevailed over Lakes Michigan and Superior. On the 18th, with increasing pressure the area was central over the Province of Ontario, followed over the Upper Lakes by brisk to high westerly winds and accompanied over the Lower Lakes and Province of Quebec by fresh to brisk southeast to southwest winds and light rains. Morning of the 19th, central over eastern Maine and New Brunswick, lowest barometer at Chatham and Eastport, 29.68 and 29.69 respectively. 20th, central with diminished pressure over the ocean south of Newfoundland in vicinity of 43° N., 60° W. and thence northeastward over Newfoundland the barometer ranged from 29.12 to 29.72, lowest at Saint Pierre, Newfoundland, with west and northwest winds varying in force from 3 to 9. The isobar of 29.60 inclosing the central depression on this day extended northeastward to Iceland, thence southeastward over Ireland to northern Italy and again northeastward over central Russia to Northwestern Siberia, north of which line the pressure rapidly diminished to the Arctic Ocean. On Cariboo Island, Nova Scotia, violent northwest storm all day, several vessels wrecked; in 46°, 36′ N., 55°, 23′ W., steamship Faraday, 29.20, violent westerly gale; in 41°, 25′ N., 56°, 30′ W., steamship Spartan, heavy NW. gale for twenty-four hours; in 40° N., 57° W. violent W. and NW. gales. 21st, depression central east of Newfoundland; at Saint John's, 29.36 W. strong, a fall of 0.15 inch in past twenty-four hours; Saint Pierre, Newfoundland, 29.56 NW.; in 43°, 50′ N., 55° W., 29.87 NW., force 6, rain; in the vicinity of 40° N., 69° W., the barometer rose from 0.40 to 0.50 inch in twenty-four hours, wind steady northwest; in 45°, 12′ N., 52°, 20′ W., S. to NW. fresh gale, heavy sea; in 48°, 56′ N., 39° W., SSW. to WSW. strong gales, high seas; in 45°, 43′ N., 51°, 19′ W., SSW. to W., increasing to moderate gale; 22d, central in about 55° N., 35° W., barometer generally below 29.75. On the following day combined with area No. XV, then central northwest of Iceland; barometer at Stykkisholm 29.25, SE., force 6, rain. No. VIII.—This storm of cyclonic origin first appeared over the Caribbean Sea, in the vicinity of 15° N., 65° W., during the 10th and 11th.

During the twenty-four hours preceding the morning of the 12th, the pressure at all West India stations east of Havana fell from 0.02 to 0.05 inch, winds shifting from east to southeast; up to the 13th, land stations, so far as shown upon our charts, gave but little indication of the development of the storm, the narrow diameter of the central area being as usual well marked. Reports from Havana on the 12th stated that there were indications, from incoming vessels, of a severe cyclone to the southeast. The following reports on the 12th show more clearly the effect of the approaching storm from the relative disposition of wind directions and the heavy rainfalls than the accompanying distribution of pressure. Steamship Vandalia, Chiriqui, C. A., 29.85, SW.; Navasea, 29.79, SE., rain, 2.59 inches rainfall in past twenty-four hours; Santiago de Cuba, 29.79, SE., cloudy; Kingston, Jamaica, 29.99, SE., cloudy, 8.10 inches rainfall in past twenty-four hours; Nassau, 29.92, NE., fair; Havana, 29.86, NE., cloudy; 13th, Kingston, Jamaica, 30.04, SE., rain, 5.50 inches rainfall in past twenty-four hours; Navassa, 29.76, E., threatening, 1.50 inches rainfall in past twenty-four hours; Santiago de Cuba, 29.83, SE., no report of weather; Havana, 29.75, E., cloudy; Key West, 29.85, E., heavy rain; Nassau, 29.91, NE., cloudy. Schooner Olive Branch wrecked at Barnett Point, Great Bahamas. Sandy Cay, Great Bahamas, bark Pahona stranded at 1.30 p. m., during a heavy easterly gale. Cienfuegos, Cuba, at 6 p. m., barometer fell to 29.65, lowest, then rose gradually to 29.90 on the 18th; wind NE. from the 10th to 10 p. m. of the 13th, when it changed to ESE. and SE.: Baracoa, Cuba, barometer fell from 29.84 at 9 a. m. of the 10th to 29.67 by 4 p. m., of the 12th, then rose to 29.84 by 9 a. m. of the 14th; wind ESE. on the 10th, 11th, and up to 9 a. m. of the 12th. at 4 p. m. changed to SSE.; 13th S., fresh and squally. Sagua la Grande, Cuba, barometer fell from 29.88 at 8 a. m. of the 12th to 29.72 by 4 p. m. of the 14th, and then rose to 29.90 by 8 a. m. of the 16th; wind E., force 5 to 7 on the 12th and 13th; ESE. and SE., force 5 and 6 on the 14th; SSE. to S. force 2 to 6 on the 15th. 14th, depression appeared to be central over the soutwestern portion of Cuba, Havana, 29.65. E., light rain; in 24° N., 84° W., 29.64, NE., force 8, cloudy; Key West, 29.74, E., light rain, 3.29 inches rainfall in past twenty-four hours; Punta Rassa, 29.86, a fall of 0.07 inch in past twenty-four hours. NE., light rain; Kingston, Jamaica, 30.11, SE., cloudy, 4.80 inches rainfall in past twenty-four hours. 15th, central over the eastern portion of the Gulf of Mexico, in about 25° N., 85° W., Havana, 29.73, SE., cloudy; Key West, 29.75, SE., cloudy; Punta Rassa, 29.76, E., light rain; Kingston, Jamaica, 30.17, hazy, 3.40 inches rainfall in past twenty-four hours. Along the northern Gulf coast the winds were northeasterly, with occasional light rains, and the barometer had fallen from 0.09 to 0.20 inch since the morning of the 14th. 16th, depression central with diminished energy, in southern Mississippi; Mobile, 29.62, W., cloudy; New Orleans, 29.73, NW. cloudy: Montgomery, 29.69, SE. light rain, 2.19 inches in past twenty-four hours; Saint Marks. 29.83, E., cloudy, 2.93 inches in past twenty-four hours. During the day area passed northward over the Mississippi Valley, combining with area No. IX, then central in Wisconsin on the morning of the 17th.

No. XVII.—Following closely upon an area of high pressure (30.30) which succeeded the passage of area No. IX, the winds shifted from NW. to S. with a decided fall in pressure over Manitoba by morning of the 19th. By morning of the 20th the barometer at Fort Garry had fallen from 30.32 on the 18th, to 29.69, and the isobar of 29.80 included nearly the whole of the extreme Northwest. 21st, central in the northern portion of the Upper Mississippi Valley, but accompanied by no precipitation. 22d, central over Lake Superior; Marquette, 29.69. W., fair; Duluth, 29.86, NW., light rain; Moose Factory, 29.67, S., fair. 23d, central with decreased pressure over the Province of Quebec, and by the following morning reached the Gulf of Saint Lawrence; lowest barometer at Charlottetown, Prince Edward Island, 29.56; light to heavy rains prevailed in New Brunswick, Nova Scotia, and adjoining islands. On this day accompanying the rapid rise in barometer over the Province of Ontario, light to heavy snow fell at several stations, with winds shifting to northwest and the thermometer ranging from 25° to 31°. During the 24th and 25th, area passed northeastward to near 60° N., 40° W. The following reports from Godthaab show the effect of the northward movement of the storm: 24th, 29.45, a fall of 0.42 inch in past twenty-four hours, wind S., cloudy; 25th, 29.14, NE., cloudy; 26th, 29.38, SSE., cloudy; 27th, 29.42, calm. During the approach and passage of the depression over Iceland, the following reports from Stykkisholm show the effect: 26th, 29.60, a fall of 0.47 inch in past twenty-four hours, wind S., force 9, rain; 27th, 29.65, W., force 9; 28th, 29.78, SW., force 2. On the 28th Thorshavn reported a fall of 0.14 inch in the barometer, winds shifting from SW. to W., and at North Unst, a fall of 0.12 inch. Rain began on the Norway coast with a fall in pressure of from 0.07 to 0.20 inch. 29th, depression probably central over northern Lapland; Tromso, 29.52, WSW., cloudy. 30th, central over the White Sea; Archangel, 29.59, a fall of 0.25 inch in past twenty-four hours. During the 31st disappeared in a high pressure area (30.40) then prevailing over Siberia. No. XX.—During the prevalence of an extremely high pressure area (30.80) over the Middle Atlantic States, and (30.60) over the South Atlantic States on the 25th and 26th, the barometer, over the central portion of the Gulf of Mexico, fell below 29.90. Bark Henrietta, 150 miles SSE., of Port Eads, La., experienced during the 26th and 27th heavy gales from ESE. to NE., with fearful sea. Brig Sally left Pensacola, Fla., for Havana, on the 25th; 26th, wind increased to a terrific gale, heavy seas sweeping decks; 27th, vessel thrown on beam-ends about 8 a. m. and capsized about one hundred miles SE. of South Pass Light, six sailors lost; sea continued very rough and dangerous throughout the 28th. As early as the 24th, reports from Havana stated that there were indications of a cyclone forming to the northwest. Schooner L. B. Wing, from Pascagoula to Sagua la Grande was struck by a violent easterly gale on the afternoon of the 25th and became water-logged. 27th, along the northern Gulf coast, the wind changed to NE. and N. with light rains, barometer still above 30.20; in 23°, 45′ N., 90°, 15′ W., 29.92 S.; Key West, 29.98 E., 3.33 inches rainfall in past twenty-four hours; in 26° N., 86° W., bark Jennie Armstrong, 26th, struck hurricane from E. and was compelled to scud before it under bare poles; 27th, gale changed to NE., which drove the vessel back off Galveston harbor. In 16° N., 87° W., 27th, schooner Mary Evelin encountered violent southwesterly gale, lost sails and sprung a leak. Brig Nellie, 24 miles off Southwest Pass, lost sails and sprung a leak during violent easterly gales. During the day the depression passed rapidly northeastward across northern Florida to the Atlantic, the barometer along the South Atlantic coast, falling from 0.25 to 0.60 inch, winds NE. and N. Heavy gales were experienced over the ocean west of the 70th meridian. In 31°, 47′ N., 71°, 16′ W. brig Victoria experienced hurricane from SW. to WNW. lasting three days, lost sails. In 32° N., 73° W. brig John Wesley, hurricane from SE. backing to NE. and N. and again around the compass, lasting eighteen hours. 28th, depression probably central off the North Carolina coast; Cape Hatteras, 29.79 NE. light rain, a fall of 0.61 inch and 3.18 inches rainfall in past 24 hours. In 37° N., 57°, 30′ ship Red Cloud in hurricane from SSE. lost sails. 60 miles north of the Bermudas, brig Terifa had terrific gale from SE. to SW. with heavy cross-seas throwing vessel on beam ends and forced to run before the gale for eight hours. In 39° N., 66° W. heavy gale from E. to S. veering to WNW. and continuing for forty hours. During the day depression passed rapidly northward off the Middle Atlantic coast and by morning of the 29th had combined with area No. XXI then central on the New England coast—No. XXI. On the 26th there were indications of the approach, southeastward, of an area of low pressure from the region north of Manitoba; at York Factory the wind shifted to SE. and the barometer had fallen 0.22 in the past twenty-four hours. By morning of the 27th the depression appeared central north of Lake Superior, barometer at York Factory indicated a fall of 0.36 inch, wind shifting to W., with light snow; Moose Factory, 29.66, SW., a fall of 0.34 inch in the past twenty-four hours. During the day the depression changed its course to the southeast and by morning of the 28th was central north of Lake Erie; lowest barometers at Alpena and Parry Sound, 29.38 and 29.40, respectively; over the Upper Lake region the winds shifted to W. and NW, increasing to brisk and high accompanied by light rains. 29th, depression central in Maine, lowest barometer at Eastport, 28.77, a fall of 1.10 inches in past twenty-four hours, or 1.16 inches below the normal reading for the month. At midnight the barometer at Sydney, C. B., read 28.73 or 1.16 inches below the normal, a fall of 1.23 inches in past twenty-four hours. In this vicinity a combination with area No. XX, as heretofore noted, produced a most remarkable change in the pressure and enlarged to a vast extent the area of barometric minima. Inclosed by the isobar of 29.60 the depression covered 20° of latitude and 25° of longitude. In the disposition of pressure over the North Atlantic, Canada, and the northeastern portion of the United States a remarkable coincidence occurred on this date, as follows: The isobar of 29.80 inclosed three separate centers of barometric minima between the meridians of 30° and 95° W. and the parallels of 35° and 55° N. The situation and lowest readings of these centers are given as follows: 29.60 in about 46° N. 34° W.; 28.77 at Eastport, Me., and 29.26 at Marquette, Mich. The first and third barometric minima belong to areas No. XIX and No. XXII, respectively. Returning to the position of area No. XXI at Eastport on the morning of the 29th it is found that heavy rains, with high to hurricane southeast to southwest and northwest winds, prevailed over Maine, New Brunswick, Prince Edward Island, and Nova Scotia. The highest wind velocities and heaviest rainfalls of the month were experienced on this date at stations in New England and the Canadian maritime provinces: Mount Washington, 132 miles NW.; Newport, R. I., 44 W.; Thatcher's Island, 57 W.; Eastport, 48 NE.; Boston, 39 W.; Saint John's, N. B., SE. to NW., strong gales—nothing like this storm for many years; Yarmouth, N. S., strong SE. to NW. gales, terrific squalls; Halifax, SE. to W., violent gales; Port Hastings, N. S., terrific hurricane from SE. to NW.; Louisburgh, N. S., heavy ESE. gale veering to S. and WSW.; Cow Bay, N. S., strong SE. to SW. gales; Glace Bay, N. S., heavy SSE. to W. gales; Sydney, N. S., violent SE. gale; Pictou, N. S., strong SW. gale; Charlottetown, P. E. Island, heavy NE. to SE. gales; Point du Chene, N. B., heavy SE. to NE. gales—tide suddenly rose three feet, carrying everything before it and causing very great damage; Chatham, N. B., violent E. storm—tide rose suddenly, carrying away bridges and flooding houses; Dalhousie, N. B., fearful gale from the E.; Percé, P. Q., very heavy gale from E. shifting to W.; Father Point, heavy N. E. gale, 72 miles per hour; Port Mulgrave, terrific hurricane, doing immense damage to buildings and houses; Hawkesbury, terrific gale from the sea, lasting three hours; Antigonish, terrific gale raged for hours, equaling in violence that of August, 1873; Shelburne, heavy SE. gale; Lockport, extremely violent SW. gale; Saint Peters, C. B., as violent as that of August, 1873; Magdalen Islands, violent E. gale, veering to SE. and blowing a perfect hurricane for twelve hours; Broad Cove, C. B., severest gale ever known; New Castle, unusually high tide, flooding lower part of town, Cocagne, tide rose higher than ever known before, rising six feet higher than the highest point during the great storm of August, 1873; Alberton, P. E. Island, highest tide ever known. Along the coasts of the Canadian maritime provinces over one hundred vessels were driven ashore or badly damaged during the storm. The following reports are from vessels along the coast or at sea: Off Nantucket South Shoals, violent NW. gale and heavy cross-seas; off Isle Haute, violent squalls and heavy sea; off Sable Island, hurricane from S., veering to E., lasting several hours, followed by a calm, continuing for fifteen minutes, when the wind changed to west, blowing with greater violence than before; in 34° N., 70° W. violent SW. gale, lasting six hours with very heavy sea; in 42°, 32′ N., 59°, 06′ W. cyclone from ESE. to W., with fearful sea; in 40° N., 62° W. hurricane from SW. to W., lasting twelve hours; in 43°, 16′ N., 60°,17′ W. violent NNW. to ESE. and W. gales; in 41°, 43′ N., 71°, 53′ W. S. to WNW. strong gale, heavy sea; in 42°, 15′ N., 59°, 49′ W. hurricane from S.; in 40°, 48′ N., 60°, 45′ W., heavy cyclone from SSW. backing to SE, and then veering to SSW., lasting two hours, at 6 p. m. had a lull of thirty minutes, barometer rose from 28.60 to 29.10, when a terrific hurricane broke out from the W., sea mountains high, ship completely buried, sails went like a cannon-shot, roar of wind was deafening for two hours, followed by a high westerly gale for three days; in 41° N., to 60° W. hurricane from SW. to NW. and continuing for sixteen hours; off George's Shoals, heavy gale from SE. to W. and NW., lasting twenty hours; in 44°, 42′ N., 60°, 05′ W. hurricane at 6.30 a. m.; 9 a. m. vessel thrown on beam ends; in 42°, 20′ N., 61°, 50′ W., strong gale from SSE. to ESE.; 6 p. m., lull for five minutes, when wind suddenly veered to SW. with hurricane force, sea broke completely over the vessel, carrying away everything; in 40° N., 63° W., hurricane from SW. to NW., lasting three hours; in 40° N., 60° W., gale from S. to NW., lasting twelve hours; in 37°, 40′ N., 62°, 30′ W., hurricane from S. veering to WNW and lasting several hours; in 41°, 58′ N., 64°, 29′ W., heavy gale from SSE., veering to W. During the 29th this storm passed northward over the Gulf of Saint Lawrence, combining on the following morning with area No. XXI, then central in the Lower Saint Lawrence valley. No. XXII.—After the passage of No. XXI eastward to the Province of Ontario by morning of the 28th, the barometer still remained below 29.80 in Manitoba and the extreme Northwest, with westerly winds, light rains and snow; lowest barometer 29.73 at Pembina, air calm. Morning of 29th depression central over Lake Superior, lowest barometer 29.26, wind W., at Marquette; following the movement of the area on this day, light rains and snow with brisk to high southwest to northwest winds prevailed in the extreme Northwest, Upper Lake region, and Province of Quebec. During the day center passed rapidly eastward over Canada, and by the following morning was central over the Gulf of Saint Lawrence, with the pressure below 29.60 between the meridians of 37° and 80° W., and the parallels of 40° and 55° N.; Father Point, 29.19, W., light rain; Windsor, N. S., 29.17, SW., cloudy; Dalhousie, N. B., 29.20, light rain; in 51° N., 56° W., 29.16, NE., cloudy; steamer Croft, on the morning of 30th, while standing off the Banks of Newfoundland, experienced strong breeze from the W., which increased to a hurricane within one hour, sea confused and dangerous, wind shifted to SW. with lightning rapidity, and barometer fell from 29.30 to 29.00; 31st, when one hundred miles off Sable Island was struck by a most terrific SW. gale, sweeping decks of everything; 30th, in 40° N., 60° W., violent W. gale, lasting for twenty-four hours. Steamer Blytheville, 30th, off Sable Island, struck cyclone, wind seemed to come from all four points at once, sea running mountain high. In 41° N., 60° W., steamer France, 30th, experienced cyclone from SE. to W., with hurricane winds and high sea for thirty-six hours; in 43° N., 44° W., 30th, heavy SW. gale, suddenly shifting to NW. with terrific squalls. 31st, passed northward into Labrador, central area still inclosed by the isobar of 29.20; the barometer at Godthaab as the storm advanced reported a fall of 0.32 inch since the morning of the 30th. The further course of this area will probably appear on the chart for November, 1879. Of the storms over the Atlantic, the following descriptions are given: No. V.—Following the disappearance of area No. I, north of parallel 50° on the 7th, the pressure fell suddenly to the southward and by morning of the 8th a depression of considerable energy appeared in about 45° N., 50° W.; steamer Hooper, from Boston to London, experienced heavy gales from NNE. veering to NE., E., SE., and S.; 9th, wind S. blowing very heavily, sea running mountain high; in 45° N., 45° W. heavy westerly gales lasting until the 12th. During the day depression moved slowly southwestward, while off Newfoundland heavy west and northwest gales prevailed, continuing through the 10th. On the 9th, in 45° 30′ N. 48° 25′ W., 29.45, NE., force 6, heavy rain; winds on the eastern coast of Newfoundland shifted from NW. to N. and NE. and the pressure fell from 0.18 to 0.27 inch. 10th, pressure over Newfoundland rose from 0.05 to 0.10 inch, winds still NE. as the storm center passed to the southeastward; in 42° 35′ N. 56° 20′ W., 29.96, NE. force 6, rain; in 45° 24′ N. 50° 55′ W. very severe NE. gale; off Grand Banks, Newfoundland, severe NNE. gale lasting twenty-four hours; off Banks of Newfoundland, steamer Plantyn, violent hurricane from E. veering to W. and lasting twenty-four hours; bark Trenton encountered fearful hurricane, seas mountain high. 11th, the following barometric readings show the extreme limit of the area of low to the east, west, and south on this date; Saint John's, Newfoundland, 29.84, NE., light rain; in 36° N., 50° W., 29.82, NW., force 6, rain; in 29° N., 38° W., 29.92, SW., force 6, rain; Angra, Azores, 29.86, S., fair. Reports from vessels at sea are given as follows: in 50° 37′ N., 32° 29′ W., SE. to S. strong gale, high confused sea; in 45° 24′ N., 50° 56′ W., NE., hard gale, high sea; in 43° 51′ N., 48° 15′ W., SE. to W., stormy, very high sea; in 44° 13′ N., 50° 04′ W., northerly gale; in 41° 50′ N., 58° 10′ W., schooner Henry Lippett, terrific gale from NE. changing to NW., lasting for five days, had to run S. to 33° N. before vessel was righted. 12th, in 35° N., 48° W., 29.63, NW., force 4; in 33° N., 37°, 40′ W., 29.80, S. force 6, rain; in 37°, 45′, N., 62° W., 29.92, force 6, cloudy; Saint John's, Newfoundland, 29.74, NW., stormy; Angra, Azores, 30.06. SSW., fair; in 44° 46′ N., 53°, 53′ W., N. hard gale, high sea; in 43° N., 53°, 42′ W., N. heavy storm; in 48°, 55′ N., 40° 50′ W., SSE, squally, high sea; in 42°, 57′ N., 54° 50′ W., fresh northeasterly gales. During the day this depression probably disappeared in an area of high pressure (30.40) central morning of the 13th northeast of the Azores. Following the disappearance of area No. V the pressure fell with considerable suddenness in the vicinity of 45° N., 50° W., the central area being inclosed within the isobar of 29.40 on the morning of the 13th. This area is not charted owing to the extreme irregularity of its course; so far as our charts would present reliable data the course of the area was circular, returning frequently upon itself, or perhaps, more strictly, it was about stationary. This peculiar condition continued from the 13th to 20th, and was very likely due to the persistent constancy of an area of high pressure (30.40) which prevailed off the western coast of Europe and from which there was no relief until the morning of the 21st. 13th, in 36°, 35′ N., 37°, 38′ W., 29.86, SSW., force 6, heavy rain; in 34° N., 46° W., 29.77, NW., force 4, cloudy; in 37°, 40′ N., 60°, 15′ W., 29.87, N., force 6, cloudy; Saint John's, Newfoundland, 29.47, W. fair; Saint Pierre, Newfoundland, 29.44, N.; in 43°, 02′ N., 59°, 59′ W., N. to NW., fresh gale, high sea; in 47°, 13′ N., 47°, 51′ W., SSE. to W., strong gale, squally, high sea. 14th, Saint John's, Newfoundland, 29.46, SW. cloudy; Saint Pierre, Newfoundland, 29.35, W.; Sydney, C. B., 29.57, NW.; in 38° N., 57° W., 29.74, WNW., force 6, cloudy. 15th, Saint John's, 29.64, S., fair; Saint Pierre, 29.48, NW; Sydney, C. B., 29.73, N., cloudy; in 39°, 40′ N., 53°, 15′ W., 29.67, SW., force 6; in 37° N., 57° W., 29.90, NW., force 4, cloudy. 16th, Saint John's, 29.82, NW., fair; Saint Pierre, 29.47, NE.; in 40°, 15′ N., 50°, 10′ W., 29.68, W., rain; in 47°, 30′ N., 41°, 40′ W., 29.78, S., cloudy. 17th, depression apparently central in 45° N., 45° W; in 45°, 40′ N., 48°, 30′ W., 29.74, SW., cloudy; in 47°, 15′ N., 43°, 25′ W., 29.78, W., rain; in 42° N., 48°, 50′ W., 29.87, NW., cloudy. 18th, probably central near 40° N., 50° W.; in 46° N., 50° W., 29.90, S., cloudy; in 42° N., 49° W., 29.64, NNW., force 6, heavy rain; in 45°, 40′ N., 38°, 45′ W., 30.00, NNE., force 6, heavy rain; in 44° N., 55° W., 29.80, NW., threatening; in 41° N., 47° W.. revolving storm, veering from ENE. by N. to SW., blowing with terrific violence, heavy rain, high cross-seas. 19th, probably central in 44° N., 45° W.; in 41°, 35′ N., 46°, 40′ W., 29.75, SSE., fair; during this and the following day combined with area No IX, then moving southeastward from the Canadian maritime provinces. No. XIX.—On the 26th as area No. XVII appeared central in about 60° N., 40° W., a very narrow barometric trough of 29.90 extended south-southwest to about 35° N., 50° W. On either side of this contracted area of low were situated two areas of extremely high pressure, 30.40 in 47° N., 30° W. and 30.80 over the Middle Atlantic States. On the 27th these two areas of high pressure were rapidly dissipated by the counteracting influence of no less than five separate areas of barometric minima between the meridians of 10° and 90° W. and the parallels of 20° and 70° N. Their respective positions can be ascertained by referring to the charting of areas No. XVII, XIX, XX, XXI and XXIII. By the morning of the 27th an area of 29.60 appeared in about 40° N., 50° W.; in 43°, 30′ N., 46°, 25′ W., 29.59, ESE., force 4, rain; 28th, in 44°, 35′ N., 45° W., 29.50, N., fair; in 41°, 11′ N., 57°, 21′ W., steamship Abana reported, noon, barometer 30.17, wind S., sea calm, clear during evening, at midnight 29.80 increasing southerly wind; 29th, 4 a. m., heavy gales from E. and S., rain in torrents, barometer

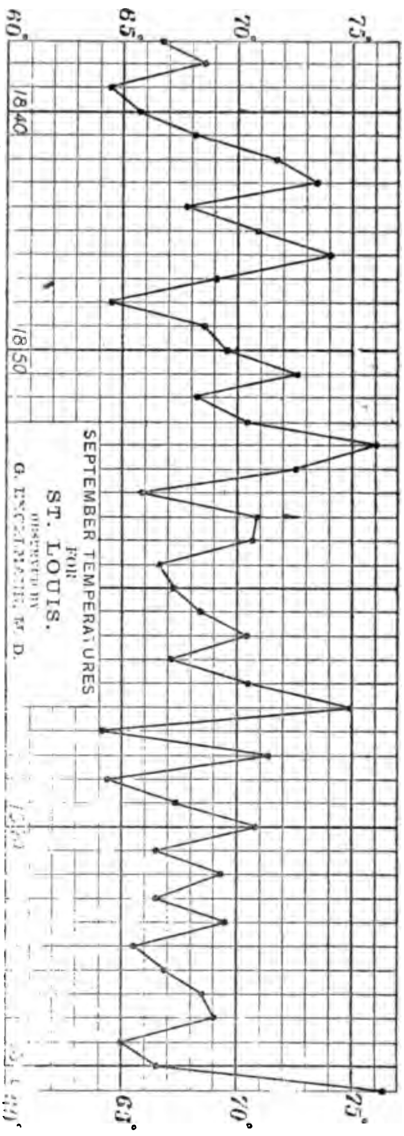
29.00, ship unmanageable on account of wind; 7 a. m., wind backed to E.; 8.30 a. m., violent hurricane, increasing in force, barometer gradually fell to 28.50; 9 a. m., barometer 28.00; 9.25 a. m., suddenly calm for fifteen minutes, the stillness being very oppressive, wind, previously from the east, now began to blow from the west with increased violence, no object visible at more than twenty feet distant, ship unmanageable; 9.50 a. m., wind WSW., heavy gale, barometer rose 0.50 inch in ninety minutes, wind continued WSW. until 6 p. m., when it hauled round to W., barometer 29.20; gales from W. and NW., continued to 7 a. m., of the 30th, after which the vessel passed into an area of high pressure (30.20) with clearing weather but a continuance of northwesterly gales. The central area of barometric minima on this day (28th) extended from near 50° N., 50° W., west-southwest to the position of area No. XX, off the North Carolina coast. Although this elongated area of low pressure is not clearly delineated upon our daily charts, reports from the logs of vessels show the barometer to have reached a very low point and the winds to have been exceedingly severe. 29th, in 45° N., 41°, 30′ W., 29.61, W., force 7, rain; in 49°, 01′ N., 33°, 14° W., NE. to SE., stormy, high seas; in 51°, 24′ N., 38°, 36′ W., SE., gale; in 47°, 45′ N., 42°, 34′ W., SE., moderate storm, rain, high sea. During the day depression lost its identity through the overwhelming influence of areas No. XXII and XXIII, central respectively over the Gulf of Saint Lawrence and between the Azores and Madeira Islands. No. XXIII.—Resulting from the extensive area of barometric minima which on the 30th prevailed from Hudson's Bay southeastward to the northwestern coast of Africa, the isobar of 29.80 inclosed the central area. At Funchal the barometer in the past twenty-four hours fell 0.10 inch, and at Ponta Delgado 0.21 inch; on the western coast of Spain and Portugal there was a rise of 0.07 to 0.13 inch, with winds shifting from NE. to S. and SE. 31st, central off the western coast of Spain and Portugal, winds backing to SE. and E. with rising pressure at land stations, rainy and threatening weather becoming general. Of the storms over the Atlantic, north of parallel 60° and over northern Europe, the following descriptions are given: No. II.—This storm is a continuation of area No. XXI of the September, 1879, chart. Central south of Iceland on the 1st, it moved northeastward north of the Faroe Islands during that day and the following, barometer at Stykkisholm, 29.27, wind N.; Thorshavn, 29.25, SSE., a fall of 0.58 inch in past twenty-four hours; Monach Light-house, 29.37, SW., a fall of 0.50 inch in past twenty-four hours; North Unst, 29.49, SSE., a fall of 0.55 inch. 2nd, Stykkisholm, 29.16, NW.; Thorshavn, 29.31, SSE.; Monach Light-house, 29.43, SW.; North Unst, 29.53, S. 3d, Stykkisholm, 29.54, ENE.; Thorshavn, 29.23, WNW.; North Unst, 29.24, SSW.; pressure along the coast of Norway fell from 0.15 to 0.25 inch, with winds shifting to SW. and SE. During the day depression passed southeastward into southern Scandinavia, accompanied to the southward over Denmark and along the southern shores of the White Sea by northwesterly gales and light rains. 4th, pressure at center generally below 29.60. 5th, central over the Gulf of Bothnia near 60° N., 20° E., with increased pressure, barometer at center below 29.80; rain prevailed at most Gulf stations with NE., S., SW. and NW. winds. 6th, central over Lapland, followed over the Gulf of Bothnia by rising pressure, northwesterly winds and clearing weather; Tromso, 29.62, SW., a fall of 0.18 inch in past twenty-four hours; Archangel, 29.81, S., a fall of 0.27 inch in past twenty-four hours. 7th, depression about stationary, disappearing by morning of the 8th north of the White Sea. No. VII.—Following the disappearance of area No. II, the pressure fell suddenly over northern Scandinavia and Lapland. 9th, Tromso, 29.59, SW. rain, a fall of 0.20 inch in the past twenty-four hours; Archangel, 29.72, SSW. rain, a fall of 0.22 inch in past twenty-four hours. 10th, central over the White Sea, with a barometric trough (29.60), extending south to parallel 50° N.; Archangel, 29.54, SSW. rain; Tromso, 29.73, calm, rain; St. Petersburg, 29.58, S. rain. 11th, central southeast of the Gulf of Finland; Moscow, 29.58, NNW.; St. Petersburg, 29.80, NE.; Dorpat, 29.87, NW.; Kieff, 29.63, ESE.; Lugan, 29.78, SW. rain. 12th, depression curved to the northeast with lowest pressure again at Archangel, 29.54, NW. a fall of 0.31 inch in past twenty-four hours; winds over central Russia shifted to S. and SW. 13th, lowest pressure at Kasan 29.46, a fall of 0.20 inch in past twenty-four hours, wind SSE; Krotkowo, 29.47, S. a fall of 0.31 inch. During the day this area dissipated under the influence of No. X, central over the Gulf of Finland, and an area of high pressure (30.30) over western Siberia. The irregularity of the movement of this area (No. VII) since the 11th was probably due to the constant high pressure over western Siberia. No. X.—On the morning of the 13th there was an extremely sudden fall of the barometer in northern Scandinavia; Umea, 28.88, a fall of 1.00 inch in past twenty-four hours, wind SW.; Hernosand, 28.91, a fall of 1.02 inch, wind SW.; Haparanda, 29.06, a fall of 0.76 inch, wind NE., light snow; Brono, 29.10, a fall of 0.80 inch, wind, NNW., 29 miles per hour. 14th, depression central near St. Petersburg, barometer 28.72, a fall of 0.86 inch in past twenty-four hours, wind WSW.; Dorpat, 29.02, NW; Archangel 29.26, ENE.; Moscow, 29.15, SE. 15th, depression about stationary with rapidly increasing pressure; St. Petersburg, 29.10, NW.; Dorpat 29.26, WNW.; Archangel 30.07, NE.; Moscow, 29.35, S. By morning of the 16th, the depression had moved northeastward, being central east of the White Sea; Archangel 29.27, NW.; Ekaterinburg, 29.30, a fall of 0.29 inch in past twenty-four hours, wind S. 17th, central in the valley of the Obi, followed by a rise of 0.46 inch at Ekaterinburg, wind shifting to W. 18th, central in the valley of the Yenisei, north of parallel 60° N.; Yeniseisk, 29.77, a fall of 0.22 inch in past twenty-four hours, wind shifting from E. to S.; Barnaul, 29.97, a fall of 0.08 inch in past twenty-four hours, wind SW. During the day area disappeared to the eastward over northern Siberia. No. XII.—On the 16th, a small area of 29.60 appeared south of Iceland; Stykkisholm, 29.73, a fall of 0.44 inch in past twenty-four hours, wind shifted from SE. to NE., with rain; Thorshavn, 29.61, a fall of 0.78 inch in the past twenty-four hours, wind shifted from N. to S. 17th, depression passed rapidly northeastward to the Norway coast; Thorshavn, 28.81, N.; Brono, 29.13, a fall of 0.67 inch in past twenty-four hours, S., rain; Bergen, 29.37, a fall of 0.75 inch in past twenty-four hours, S., rain; Tromso, 29.35, a fall of 0.25 inch in past twenty-four hours, NE., cloudy; Christiania, 29.45, a fall of 0.69 inch in past twenty-four hours, SW., rain; the winds over the British Isles shifted to N. and NW., with increased force and rapidly falling pressure, the latter, owing to the formation of a barometric trough extending from Lapland southwestward to the Bay of Biscay. 18th, with enlarged area the depression became central south of the Gulf of Finland; Dorpat, 29.35, a fall of 0.67 inch in past twenty-four hours, ENE., heavy snow; St. Petersburg, 29.47, a fall of 0.51 inch, E., snow; Wilna, 29.27, a fall of 0.70 inch, NW., threatening; Kieff, 29.47, a fall of 0.21 inch, WNW., light rain; Moscow, 29.39, a fall of 0.78 inch, SE., rain. 19th, on this date the isobar of 29.80 covered the whole of Europe north of the 50th parallel, area No. XIII being central southeast of Iceland and No. XII between the Gulf of Finland and the White Sea. Archangel, 29.21, a fall of 0.66 inch in past twenty-four hours, E., snow; St. Petersburg, 29.13, W., snow; Dorpat, 29.35, stationary, W., snow. During the day the depression disappeared east of the White Sea under the influence of a high area over western Siberia. No. XIII.—On the 17th, the barometer at Stykkisholm rose 0.18 inch, wind veered from NE. to E. after the passage of area No. XII. At Godthaab, barometer rose slightly, wind veered from NE. to S. 18th, Stykkisholm, 28.83, a fall of 1.08 inches in past twenty-four hours, SE., force 8, rain; Godthaab, 29.61, a fall of 0.20 inch in past twenty-four hours, SW., cloudy; Thorshavn, 29.65. SSE., a fall of 0.17 inch. 19th, Stykkisholm, 28.87, WSW., rain; Godthaab, 29.42, N., cloudy; Thorshavn, 28.78, NW.; North Unst, 28.72, a fall of 1.04 inches in past twenty-four hours, W., force 6; Monach Light-house, 28.98, W., force 6, a fall of 0.78 inch. 20th, pressure below 29.80 over the whole of Europe north of the 45th parallel; area central over southern Scandanavia inclosed by the isobar of 28.80; Bergen, 28.72, NNW., a fall of 0.25 inch in past twenty-four hours; Brono, 29.01, E., a fall of 0.21 inch; Christiania, 28.76, S., a fall of 0.51 inch; Upsala, 28.76, SSW., a fall of 0.59 inch in past twenty-four hours; Vestervig, 28.81, a fall of 0.38 inch, W., rain; over Denmark the pressure was below 29.00, winds southwesterly. 21st, depression central over the Gulf of Bothnia, with considerably diminished pressure, the isobar of 29.20 inclosing the central area; lowest barometer at Wisby, 29.07, WNW; clearing weather, with SW. to NW. winds and rising pressure, prevailed over the British Isles and central Europe. 22d, central over Finland; Archangel, 29.41, S.; St. Petersburg, 29.48, S.; Haparanda, 29.44, N.; Umea, 29.45, N.; Hernosand, 29.50, NW.; Dorpat, 29.53, S., rain. During the day disappeared east of the White Sea in a high pressure area over western Siberia. No. XIV.—Following the passage of No. XIII the barometer, at Stykkisholm on the 20th, rose 0.69 inch, winds shifting from W. to E., but by morning of the 21st there was a fall of 0.21 inch reported, wind S., rain. 22d, depression central off the coast of Norway; Brono, 29.24, S., a fall of 0.17 inch in past twenty-four hours; Tromso, 29.34, SW.; Haparanda, 29.44, N.; on this day the centers of the two areas, Nos. XIII and XIV, were on nearly the same parallel and within 20° of longitude. 23d, depression central over Finland; Umea, 29.13, N.; Haparanda, 29.26, N.; Hernosand, 29.25, WNW.; St. Petersburg, 29.31, SW.; Dorpat, 29.47, SW. 24th, central over the White Sea; Archangel, 29.34, W., a fall of 0.11 inch; during the day passed southeastward into northwestern Siberia. 25th, Ekaterinburg, 29.87, NW, a fall of 0.11 inch in past twenty-four hours; area passed slowly southeastward over the valley of the Obi and by morning of the 26th, Barnaul barometer read 29.82, or a fall of 0.33 inch, wind shifted from NW. to S.; Yeniseisk, 29.89, a fall of 0.46 inch, wind shifted to SE. 27th, Barnaul, 29.65, NW., threatening; Yeniseisk, 29.78, S., rain. 28th, Barnaul, 30.24, SW., snow; Yeniseisk, 30.11, W., cloudy. No. XV.—On the 21st the barometer at Godthaab read 29.34, a fall of 0.14 inch in past twenty-four hours, wind veering to E., from N. on the 19th and NNE. on the 20th. 22d, Godthaab, 29.25, wind backed to NW.; Stykkisholm, 29.74 E., force 8, a rise of 0.39 inch in past twenty-four hours. 23d, Godthaab, 29.87, SW.; Stykkisholm, 29.25, SE., rain. During the day the depression moved rapidly eastward and by morning of the 24th was central north of the Shetland Isles. Thorshavn, 29.33 W.; North Unst, 29.42, NW.; Bergen, 29.47, S., rain; Brono, 29.56, calm; Tromso, 29.57, calm. 25th, central over the North Sea; winds over the British Isles from NE. to W.; over northern France, Germany, and Denmark W. to SE., pressure generally below 29.80, central area below 29.60. During the day the depression probably disappeared over Germany through the influence of approaching high areas to the east and west, 30.60 north of the Azores and 30.20 over central Russia. Had our daily charts reported the distribution of atmospheric pressure for more than one hour of the day it is more than probable that area No. XVIII would prove to be but a continuation of No. XV. No. XVIII.—The peculiar course of this probably separate area appeared to be due to the encroachment of high-pressure areas situated to the east and west. On the morning of the 26th the barometer fell very suddenly over the Bay of Biscay, followed by the appearance of an area of 29.60 off the northern coast of Spain; rain, with southerly winds, commenced at Spanish stations on the 26th, continuing throughout the remainder of the month. 26th, Santiago, 29.61, SE., rain, a fall of 0.40 inch in past twenty-four hours; Bilbao, 29.78, S., cloudy, a fall of 0.24 inch in past twenty-four hours; along the coast of France there was a fall of 0.05 to 0.08 inch, winds shifting from W. to SE. and E.; Lisbon, 29.85, SW., a fall of 0.13 inch in past twenty-four hours. 27th, Santiago, 29.69, SSE.; Lisbon, 29.67, S., rain; Campo Major, 29.82, SE., rain. During the day the high areas previously spoken of as situated to the east and west combined to the northward over Europe between the parallels of 50° and 60° N., forming an area of 30.40. Throughout the 28th and 29th the depression remained about stationary over Portugal and western Spain, accompanied by southerly winds and rain; by morning of the 30th had disappeared to the eastward in an area of high pressure, 30.20, followed to the westward by slowly rising pressure and southeasterly winds, the latter owing to the advance of area No. XXIII from the southwest. Of the storms over southern Europe the following descriptions are given: No. VI.—While area No. II appeared central near the White Sea on the 7th, the pressure fell considerably over that portion of Russia just north of the Black Sea, forming by morning of the 8th an area of 29.80; Kieff, 29.71, WNW., a fall of 0.24 inch in past twenty-four hours; Nikolaeiv, 29.85, W., a fall of 0.23 inch; Lugan, 29.79; calm, a fall of 0.21 inch. 9th, depression about stationary; Kieff, 29.82, NE.; Nikolaiev, 29.89, S.; Lugan, 29.81, NE. 10th, Kieff, 29.77, NW.; Nikolaiev, 29.84 NNW.; Lugan, 29.68, E. During the day area No. VII, then central over the White Sea, formed a barometric trough of 29.60, which extended southward to parallel 50° N., with which, by morning of the 11, area No. VI combined; lowest barometer at Moscow, 29.58, NW., a fall of 0.20 inch in past twenty-four hours. No. XI.—During the 14th there was a fall in pressure of from 0.25 to 0.35 inch over Switzerland and northern Italy, winds S. and SW., accompanied by light to heavy rains, pressure generally below 29.80. By morning of the 16th a decided depression had formed over the central portion of Italy inclosed within the isobar of 29.60; Leghorn, 29.38, W., a fall of 0.48 inch in past twenty-four hours; Pesaro, 29.39, SW., a fall of 0.41 inch; Genoa, 29.41, N., a fall of 0.37 inch; Florence, 29.42, W., a fall of 0.42 inch. 17th, with rising pressure, clearing weather and northerly winds the central area passed eastward into northern Turkey; Hermannstadt, 29.42, NW., rain, a fall of 0.32 inch in past twenty-four hours; Constantinople, 29.63, SSW., a fall of 0.39 inch; Valona, 29.83, S., cloudy, 1.85 inches rainfall in past twenty-four hours. 18th, depression central in eastern Austria; Lemberg, 29.59, NW., hail storm, 2.01 inches rainfall in past twenty-four hours; Hermannstadt, 29.85, WNW.; Szathmar, 29.80, SW.; Szegedin, 29.80, W. During the day this depression lost its identity over western Russia through the influence of area No. XII then passing to the eastward near the Gulf of Finland, but on that day the isobar of 29.60 extended southward to the Black Sea and covered nearly the whole of central Europe. No. XVI.—The powerfully disturbing effects of area No. XIII, particularly on the 20th and 21st, causing the lowest barometric readings of the month over Europe, appeared to be instrumental in the formation of another depression over Italy. On the morning of the 21st the barometer indicated a fall of from 0.25 to 0.50 inch in past twenty-four hours at northern stations, the central area being inclosed by the isobar of 29.60; lowest barometer, 29.51 at Leghorn; rainfall quite general. 22d, with increased pressure, the central area (29.80) covered the southern half of the kingdom; winds variable, lowest barometer 29.58 at Cosenza, 1.07 inches rainfall in past twenty-four hours. 23d, central in the valley of the Danube, accompanied by quite general rains, with northwesterly winds over Austria and southeasterly winds over Turkey. Over Italy northerly winds and clearing weather prevailed. By morning of the 24th depression had disappeared to the eastward in an area of high pressure, 30.20, prevailing in the vicinity of the Caspian Sea. No storms have been charted on the Asiatic coast, although this month is one (last one) of the four comprising the typhoon season of the China and Japan seas. There are some reports from the logs of vessels which indicate the presence of these storms, but the data is irregular and the stations on the Asiatic coast are so few from which reports are regularly received, that it is not deemed advisable to attempt the indication of storm tracks on the chart, and the following disconnected data is furnished, principally from the reports of vessels: Steamship Gaelic, Hong Kong, 8th, 29.59, NE., force 8 to 9; 9th, 29.80, NNE., force 2; 10th, 29.91, NE., force 5, heavy squalls at intervals. Hong Kong, 9th, typhoon a little to the south; at 4.30 p. m., 29.32, typhoon probably moved from SE. to NW. Manila, 7th, 29.70, WSW.; 8th, 29.79, S. Zi-Ka-Wei, 26th, between 4.45 and 5.00 a. m., typhoon passed over station, wind shifted from ESE. to WNW., lowest barometer 29.76. Macao, 26th, 29.97, a fall of 0.11 inch in past twenty-four hours, wind shifted from SE. to S. Hong Kong, 25th, heavy NE. gale. Manila, 26th, 29.81, NE. Steamship Gaelic, 23d, in 25°, 18′ N., 119° 59′ E., 30.10, N., force 5, rough sea, threatening; 24th, in 27° 04′ N., 124°, 01′ E., 29.90, SSE., force 4, moderate sea, threatening; 25th, in 28° 56′ N., 128°, 31′ E., 29.82, W., force 5, rough sea, rain; 26th, in 30°, 29′ N., 133° 11′ E., 30.00, NW., force 5, rough sea, squally. Nagasaki, 26th, 29.66, a fall of 0.45 inch in past twenty-four hours, wind shifted from N., to W., rainfall 1.86 inches; 27th, 30.00, NW., cloudy. Hiroshima, 26th, 29.80, a fall of 0.35 inch in past twenty-four hours, wind shifted from ENE. to NNE., rainfall 1.30 inches; 27th, 29.91, NNW., clear. Tokei, 26th, 30.10 a rise of 0.07 inch in past twenty-four hours, wind shifted from NNW. to N., rainfall 1.58 inches; 27th, 29.64, N., rainfall 1.08 inches. Waykayama, 26th, 29.91, a fall of 0.22 inch in past twenty-four hours, wind shifted from NE. to ENE., rainfall 5.59 inches; 27th, 29.83, N., cloudy. On the 28th a pressure of from 30.03 to 30.17 covered the Japan Islands, winds shifting to SW. and NW. with clearing weather. It seems very probable from a study of the daily charts since the 24th, notwithstanding the scarcity of data, that a typhoon appeared on that date over the China Sea, south of Hong Kong, pursuing thereafter a northeasterly course, hugging the coast closely, perhaps crossing the Island of Formosa, and after reaching the latitude of the Lew Chew Islands curved more to the east, then again to the northeast, passing off the Bay of Yeddo on the 27th. It will be seen from the following record of maximum readings for the month over the Japan Islands and along the Asiatic coast from 25° to 50° N., that few typhoons could have pursued their customary paths between these parallels: 1st, 30.27; 2d, 30.29; 3d, 30.33; 4th, 30.52; 5th, 30.34; 6th, 30.25; 7th, 30.25; 8th, 30.29; 9th, 30.44; 10th, 30.39; 11th, 30.24; 12th, 30.20; 13th, 30.24; 14th, 30.27; 15th, 30.34; 16th, 30.33; 17th, 30.33; 18th, 30.26; 19th, 30.22; 20th, 30.26; 21st, 30.21; 22d, 30.27; 23d, 30.21; 24th, 30.22; 25th, 30.15; 26th, 30.10; 27th, 30.22; 28th, 30.32; 29th, 30.32; 30th, 30.32; 31st, 30.28. Over the China Sea and Philippine Islands the development and passage of typhoons may have occurred with the usual frequency, but little can now be said regarding that probability, owing to the extreme paucity of reports from these localities.

TEMPERATURE OF THE AIR.

The mean temperature of the air for September, 1881, is shown by the isothermal lines (in red) on Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month and the departures of such means from the average for many years. South and east of a line extending southwestward from Lake Michigan to New Mexico, the temperature is everywhere above the normal. The excess ranges from about normal in the Florida peninsula and Rio Grande valley to 8°.9 in the Lower Lake region. There is a slight excess reported from the Southern Pacific Coast region. The mean temperature of the present month is remarkably high over the eastern portion of the country. In comparison with previous years the departures from normal are found to be the largest by from 2° to 3° that have occurred since the establishment of Signal Service stations. The region of greatest excess (from +5°.7 to +8°.9) is embraced by the following districts: Upper Mississippi Valley, Ohio Valley and Tennessee, Middle Atlantic States, and the Lower Lake region. Since 1872 the following are the maximum departures of excess, with corresponding districts: 1873, +0°.6, West Gulf States; 1874, +5°.8 and +4°.7, Upper and Lower Lakes, respectively; 1875, all deficiencies; 1876, all deficiencies; 1877, +5°.9 and +4°.6, in the Upper Missouri and Upper Mississippi Valleys, respectively; 1878, +3°.6, Upper Lakes; 1879, +5°.8, Western Plateau; 1880, +1°.8 and +1°.9, in New England and the Northern Plateau, respectively. Throughout the Plateau and in the Middle and Northern Pacific Coast regions, in Minnesota and the Missouri Valley, the temperature is below the average, the deficiency ranging from —0°.8 in Minnesota to —5°.1 in the Northern Plateau.

Ranges of temperature at signal service stations.—Monthly ranges in general varied from 25° to 40° over the country east of the Rocky Mountains, and from 45° to 60° to the westward of that region. The smallest ranges were: Punta Rassa, 20°; Key West, 21°; Portsmouth, N. C., 22°; Hatteras and Fort Macon, 23°; Port Eads, 24°; Charleston, Savannah, Galveston, and Jacksonville, 25°; Cedar Keys, Charlotte, Smithville, and Wood's

Holl, 26°; Chincoteague, 27°; Cape Henry and Norfolk, 28°. The largest were: Fort Gibson, 73°; North Platte, 72°; Eagle Rock, 69°, Winnemucca, 68°; Fort Bennett and Campo, 65°; Yankton, 64°. The daily ranges varied in the different districts as follows: New England, 15° at New Shoreham to 33° at Thatcher's Island; Middle Atlantic States, 19° at Atlantic City to 35° at Sandy Hook and Washington; South Atlantic States, 15° at Charleston and Portsmouth to 24° at Augusta Florida; Peninsula, 17° at Key West to 19° at Cedar Keys; Eastern Gulf States, 20° at Pensacola to 29° at Vicksburgh; Western Gulf States, 13° at Port Eads and 16° at Galveston to 38° at Shreveport and 47° at Fort Gibson; Ohio Valley and Tennessee, 22° at Cincinnati to 32° at Knoxville and Champaign; Lower Lake region, 24° at Toledo to 31° at Buffalo; Upper Lake region, 25° at Grand Haven and Escanaba to 32° at Chicago; Upper Mississippi Valley, 27° at Cairo to 35° at Dubuque and 44° at Saint Paul; Missouri Valley, 32° at Leavenworth to 42° at Fort Bennett; extreme Northwest, 34° at Moorehead to 45° at Fort Buford; Northern Slope, 40° at Cheyenne to 50° at Fort Keogh and North Platte; Middle Slope, 47° at Fort Elliott to 41° at Denver and 45° at Dodge City; Southern Slope, 24° at Henrietta to 39° at Concho and 44° at El Paso; Rio Grande Valley, 27° at Brownsville to 36° at Rio Grande and 38° at Castroville; Northern Plateau, 40° at Lewiston to 47° at Missoula; Middle Plateau, 32° at Salt Lake City, 35° at Pioche, and 57° at Winnemucca; Southern Plateau, 25° at Fort Grant to 45° at Prescott and 46° at La Mesilla; North Pacific coast, 35° at Olympia to 44° at Roseburg; Middle Pacific coast, 22° at San Francisco to 38° at Sacramento; Southern Pacific coast, 23° at San Diego to 45° at Los Angeles and 55° at Campo.



Deviations from mean temperatures.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of Chart No. II. The following items of importance in connection with this subject are reported by voluntary observers: *Connecticut:* Southington, month marked by extreme heat; mean temperature far above the average; higher than the mean of August for the past six years, and the mean of June for the past twelve years, being nearly equal to the mean of the warm July of 1875. *Illinois:* Rockford, mean temperature considerably above the average. *Iowa:* Clinton, mean temperature 7°.8 above the mean for 1880, and 9°.9 above the mean for 1879; first September for many years without frost. *Kansas:* Lawrence, mean temperature 4°.8 above the mean for the past thirteen years. *Maine:* Gardiner, mean temperature 3° above that of past forty-five years; but three instances during that period where the monthly means exceeded that of the present month; in 1841 mean temperature 3°.05 above the mean of the present month. *Maryland:* Fallston, mean temperature 9°.7 above mean of past ten years; Sandy Springs, mean temperature 7° above that of the past fifteen years; warmer than any August for past ten years, and warmer than any June for the past fifteen years. *Missouri:* Saint Louis, the Missouri Weather Service reports: Mean temperature considerably above the average of the past forty-five years; highest mean during that period, 76°.0 in 1854; highest maximum 102°.5 in September, 1864; lowest minimum, 35° in September, 1839. *Nebraska:* Nebraska Weather Service reports: Mean temperature of the State 4° above September, 1880. *New Hampshire:* Contoocookville, mean temperature, 5°.2 above the average for the past eleven years. *New York:* Waterburg, mean temperature unprecedented as compared with the average of the past ten years; warmest September during that period occurred in 1878, which was 9°.4 below that of the present year; the highest mean temperature recorded for any month during the past ten years occurred in July, 1878, and is only 0°.8 above that for September, 1881. North Volney, mean temperature 8°.9 above that for the past thirteen years; highest mean for any September during that period was 64°.2 in 1869, which mean is 5° below that of September, 1881. *Pennsylvania:* Dyberry, mean temperature 6°.5 above that of past twenty years. West Chester, mean temperature considerably above the average for the past twenty-six years. *Texas:* Clarksville, mean temperature 5° above the mean for the past twelve years. *Vermont:* Woodstock, mean temperature 6°.5 above the mean for the past ten years; 13°.5 above the mean of September, 1871, and considerably warmer than any September for the past fourteen years; warmest September during that period occurred in 1880, mean 59°.63; coldest in 1871, mean 49°. *Virginia:* Johnsontown, warmest September in past thirteen years; highest mean temperature (74°.6) during that period occurred in 1878, which is 5°.2 below the mean of the present month. *West Virginia:* Flemington, mean temperature remarkably high; month unusually hot. Helvetia, mean temperature 7°.9 above that of past five years.

High temperatures.—The maximum temperatures of the month have in many instances been very remarkable, yet the suffering to animal and vegetable life did not assume the proportions of either of the two previous months. The regions within which the extremes of heat occurred coincided, as in July and August, with that section of the country reporting the greatest departure of the monthly mean from the average for many years. Compared with August there has been a very decided translation eastward of the area of excessive heat, and a remarkable increase of relative departures from the normal. The maximum temperatures, occurring as they did between the 4th and the 10th, became associated with the passage of low areas Nos. I and II, whose extreme northerly courses were conducive to the accompanying movement of continued southerly winds over the central and eastern portions of the country. Dubuque, 5th, one case of sunstroke, first reported this year. Chicago, 6th, 94°, highest since 1873. Cincinnati, during the week ending the 10th three fatal cases of sunstroke occurred. Baltimore, 6th, several cases of sunstroke; 7th, 101°, highest ever recorded. Philadelphia, 7th, 101°.5, highest for the past ten years. Fort Myer, Va., 7th, 102°, highest ever recorded. Freehold, N. J., 7th, 100°, hottest since 1873; work suspended in the mills and at the iron foundery. New York City, 27th, 102° in the shade; two sunstrokes, none fatal. Southington, Conn., 7th, 100°, highest ever experienced. Charleston, Ill., 5th, 102°, highest for many years; extreme suffering from heat. Upper Alton, Ill., 5th, 101°. Anna, Ill., 5th, 102°. Laconia, Ind., 5th, 101°. Vevay, Ind., 5th, 100°. Forsyth, Ga., 4th, 100°. Rockford, Ill., 5th, mean temperature, 83°.5, highest daily mean reported during summer. Muscatine, Iowa, 5th, 103°. Clay Centre, Kans., 3d, 109°. Independence, Kans., 3d, 105°. Lawrence, Kans., daily maximum temperature exceeded 90° on fourteen days. Fallston, Md., 7th, 102°.5, higher than the highest maximum ever before recorded. Sandy Springs, Md., 7th, 98°.7 higher than the maximum temperature for any September during the past fifteen years, and 3° above the highest maximum for the year 1881. Woodstock, Md., 6th, 98°, the highest maximum for September during the past sixteen years. Dyberry, Pa., 7th, 95°, 8 higher than the highest maximum recorded during September for the past twenty years. Woodstock, Vt., 7th, 93°; 0°.4 above the highest maximum of any September during the past ten years.

Low temperatures.—Fort Supply, Ind. T., 7th, 275 head of cattle and three horses reported frozen to death at Beaver Creek, twelve miles west of station; confirmatory report from Castroville, Tex., 10th, stated that a large number of cattle were chilled to death near Fort Supply, from an extremely sudden fall in the temperature.

Table of comparative maximum temperatures for the month of September.

State or Territory.	Maximum for September, 1881, Signal Service.		Highest since Signal Service stations were opened—3 to 10 years.			Highest from any other source.			
	Station.	Temp.	Station.	Year.	Temp.	Place.	Year.	Temp.	Length of record.
		°			°			°	*Years.*
Alabama	Montgomery and Mobile	96	Montgomery	1875	97	Mount Vernon Arsenal	1860	98	31
Arizona	Yuma	107	Burke's and Yuma	1879	113	Fort McDowell	1879	114	14
Arkansas	Little Rock	97	Little Rock	1880	90	Fort Smith	1860	101	21
						Little Rock	1840	88	87
California	Los Angeles	102	Red Bluff	1877	106	Fort Miller	1853	114	13
Colorado	Denver	88	Denver	1878	93	Fort Lyon	1868	99	19
Connecticut	New Haven	100	New London	1880	89	Columbia	1866	94	9
						Fort Trumbull	1872	90	47
						New Haven	1864	92	87
Dakota	Yankton	100	Fort Sully	1874	107	Fort Randall	1863	107	20
						Fort Sully	1874	106	14
Delaware	Delaware Breakwater	93				Fort Delaware	1865	90	44
District of Columbia	Washington	104	Washington	1880	94	Washington	1838	95	58
Florida	Jacksonville & Key West	94	Jacksonville	1875	98	Fort Jefferson	1871	100	12
						Fort King	1833	100	10
Georgia	Augusta	97	Augusta	1875	97	Oglethorpe Barracks	1845	99	36
Idaho	Fort Lapwai	90	Boisé City	1878	96	Fort Boisé	1874	103	16
Illinois	Cairo	97	Cairo	'75, '76	92	Manchester	1864	102	10
						Highland	'41, '43	100	11
Indiana	Indianapolis	95	Indianapolis	'74, '75	90	Vevay	'65, '66	99	15
Indian Territory	Fort Gibson	105	Fort Gibson	'74, '80	98	Fort Gibson	1834	103	52
			Fort Sill	1877	98	Fort Sill	1871	103	10
Iowa	Keokuk	97	Dubuque	1878	92	Mount Vernon	1874	99	16
Kansas	Dodge City	99	Dodge City	1876	99	Fort Leavenworth	1860	108	49
Kentucky	Louisville	99	Louisville	1875	93	Newport Barracks	1864?	96	28
Louisiana	Shreveport	101	Shreveport	1877	98	Fort Jesup	1824	100	22
Maine	Portland	95	Eastport	1877	81	Brunswick	1825	96	52
Maryland	Baltimore	101	Baltimore	1875	92	Fort Washington	1851	99	37
Massachusetts	Boston	102	Boston	1880	93	Fort Warren	1872	100	18
Michigan	Port Huron	97	Detroit and Marquette	1874	97	Fort Brady	1861	98	57
Minnesota	Saint Paul	91	Saint Paul	1878	94	Fort Snelling	'38, '77-8	92	60
Mississippi	Vicksburg	98	Vicksburg	1878	100	Columbus	1865	95	9
Missouri	Saint Louis	102	Saint Louis	1875	92	Allentown	1868	100	3
						Jefferson Barracks	1864	99	35
Montana	Fort Benton	95	Fort Keogh	1879	96	Tongue River	1877	103	3
						Fort Benton	1878	101	11
Nebraska	North Platte	101	North Platte	1876	97	Fort McPherson	1870	102	14
Nevada	Winnemucca	90	Winnemucca	'78, '80	94	Fort McDermitt	'75, '79	96	15
New Hampshire	Mount Washington	64	Mount Washington	1880	65	Dartmouth College	'43, '45	92	17

Table of comparative maximum temperatures for the month of September—Continued.

State or Territory.	Maximum for September, 1881, Signal Service.		Highest since Signal Service stations were opened—3 to 10 years.			Highest from any other source.			
	Station.	Temp.	Station.	Year.	Temp.	Place.	Year.	Temp.	Length of record.
		°			°			°	*Years.*
New Jersey	Sandy Hook	101	Atlantic City	1880	94	Haddonfield	1866	90	6
New Mexico	La Mesilla	99	La Mesilla	1879	105	Fort Craig	'57-'71	103	26
New York	New York City	100	New York City	1875	94	Poughkeepsie	1849	100	20
North Carolina	Charlotte & Kittyhawk	92	Kittyhawk	1880	95	Fort Johnson	1831	98	54
			Wilmington	'75, '76	95				
Ohio	Cleveland and Columbus	98	Cincinnati	1874	92	Cincinnati	1868	100	35
Oregon	Umatilla	91	Umatilla	'77, '79	95	Fort Haskins	1860	98	9
Pennsylvania	Philadelphia and Pittsburgh.	102	Pittsburgh	1874	97	Carlisle Barracks	1868	97	34
Rhode Island	Newport	88	Newport	1880	87	Providence	1866	90	35
South Carolina	Charleston	93	Charleston	1876	94	Fort Moultrie	1851	93	27
Tennessee	Memphis and Nashville	98	Memphis and Nashville	1875	93	Humboldt	'71, '74	97	4
Texas	Eagle Pass	104	Rio Grande	1877	107	Fort Stockton	1873	109	21
Utah	Salt Lake City	87	Salt-Lake City	1875	93	Fort Douglas	1876	97	18
Vermont	Burlington	90	Burlington	1880	90	Lunenburg	1864	90	8
Virginia	Fort Myer	102	Norfolk	1880	96	Fort Monroe	1863	97	54
Washington Territory	Dayton	91	Dayton	1880	88	Fort Walla Walla	1860	98	10
West Virginia	Morgantown	91	Morgantown	1874	90	Weston	1876	88	4
Wisconsin	Madison and Milwaukee	92	Milwaukee	1874	94	Fort Howard	'26-'30	98	30
Wyoming	Cheyenne	86	Cheyenne	1875	88	Fort Laramie	1871	99	26

Frost.—In the various States and Territories it was reported, as follows: Arizona, 24th, 29th; Arkansas, 16th; California, Campo, 1st to 24th, 27th, 29th, 30th; Colorado, 10th; Dakota, 6th, 7th, 8th, 14th to 17th, 21st, 22d, 26th, 28th; Idaho, 2d, 6th to 16th, 19th to 22d, 24th, 26th, 27th, 29th, 30th; Illinois, 10th, 13th; Iowa, 10th, 12th, 28th; Kansas, 16th, 17th; Maine, 7th, 21st, 22d; Massachusetts, 2d, 28th; Michigan, 14th, 28th, 29th; Minnesota, 6th, 7th, 15th, 22d, 26th, 28th, 30th; Missouri, 11th, 16th; Montana, 1st, 2d, 5th, 7th, 9th to 17th, 21st, 25th to 29th; Nebraska, 16th, 28th; New Hampshire, 13th, 28th; New York, 12th, 14th, 29th; Nevada, 4th, 6th, 7th, 19th, 24th, 27th, 29th, 30th; Ohio, 12th; Oregon, 10th, 27th, 30th; Pennsylvania, 12th, 14th; Tennessee, 18th; Texas, 7th, 17th; Utah, 6th to 10th, 25th to 27th, 30th; Vermont, 21st, 22d, 29th; Washington Territory, 2d, 6th, 9th, 26th, 30th; Wisconsin, 28th, 29th; Wyoming, 10th, 15th to 17th, 30th.

Table of maximum and minimum temperatures for September, 1881.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Montgomery	96	57	Green Springs	98	56
Do	Mobile	96				
Arizona	Yuma	107		Texas Hill	118	
Do	Prescott		34			
Arkansas	Little Rock	97	47	Mount Ida	98	34
California	Los Angeles	102		Colton	112	
Do	Campo		33	Boca		24
Colorado	Denver	88	37			
Do				Fort Lewis		25
Connecticut	New Haven	100	47			
Dakota	Yankton	100		Fort Randall	102	
Do	Fort Sully		21			
Delaware	Breakwater	93	63			
District of Columbia	Washington	104	60			
Florida	Cedar Keys	94		Fort Brooke, Tampa.	98	
Do	Jacksonville	94		Fort Barrancas		55
Do	Key West	94				
Do	Pensacola		62			
Georgia	Augusta	97		Forsyth	100	
Do	Atlanta		60	McPherson Barracks		58
Idaho	Fort Lapwai	90				
Do	Eagle Rock		17			
Illinois	Cairo	97		Anna and Charleston	102	
Do	Springfield		47	Riley		42
Indiana	Indianapolis	95	48	Laconia	101	
Do				Logansport		44
Indian Territory	Fort Gibson	105	32			
Iowa	Keokuk	97		Muscatine	103	
Do	Des Moines		40	Nora Springs		37
Kansas	Dodge City	99	39	Clay Centre	109	
Do				Fort Wallace		29
Kentucky	Louisville	99	54			
Louisiana	Shreveport	101	47			
Maine	Portland	95		Orono		33
Do	Eastport		41			
Maryland	Baltimore	101	59	Fallston	102	
Do				Cumberland		54
Massachusetts	Boston	102		Williamstown		43
Do	Springfield		46			
Michigan	Port Huron	97		Thornville	100	
Do	Marquette		42	Fort Brady		40
Minnesota	Saint Paul	91				
Do	Saint Vincent		24			
Mississippi	Vicksburgh	98	51	Fayette		48
Missouri	Saint Louis	102	49	Pierce City		34
Montana	Fort Benton	95				
Do	Fort Missoula		23			
Nebraska	North Platte	101	30	Clear Creek and Genoa.	103	
Nevada	Winnemucca	90	22	Hot Springs	98	
New Hampshire	Mount Washington	64	28	Auburn and Contoocookville.	95	
New Jersey	Sandy Hook	101		Atco and Vineland	104	
Do	Atlantic City and Cape May.		55	Freehold		46
New Mexico	La Mesilla	99	43	Fort Union		25
New York	New York City	100		Pen Yan	102	
Do	Buffalo		45	Madison Barracks		39

Table of maximum and minimum temperatures for September, 1881—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
North Carolina	Charlotte	92		Weldon	97	
Do	Kittyhawk	92		Franklin and Murphy.		55
Do	Smithville		60			
Ohio	Cleveland	98	50	College Hill	102	
Do	Columbus	98	50	Westerville		43
Oregon	Umatilla	91	35			
Do	Roseburgh		35			
Pennsylvania	Philadelphia	102		Milton	105	
Do	Pittsburgh	102	51	Franklin		38
Rhode Island	Newport	88	51	Fort Adams	96	
South Carolina	Charleston	93	68	Aiken	95	65
Do				Columbia	95	
Tennessee	Memphis	98		Ashwood	100	
Do	Nashville	98	50			
Texas	Eagle Pass	104				
Do	Grierson Springs		42			
Utah	Salt Lake City	87	36	Fort Douglas		34
Vermont	Burlington	90	41	Charlotte	92	
Do				Lunenburg & Windsor.		39
Virginia	Fort Myer	102	53	Accotink	104	
Do				Snowville & Wytheville.		48
Washington Territory	Dayton	91				
Do	Colfax		27			
West Virginia	Morgantown	91	50	Flemington	99	44
Do				Helvetia		44
Wisconsin	Madison	92	46	Edgerton	98	
Do	Milwaukee	92	46	Neillsville		34
Do	La Crosse		46			
Wyoming	Cheyenne	86	32	Fort Bridger		15

Ice.—Fort Gibson, 16th, formed in exposed places. Clay Centre, Kans., 17th. Cheyenne, 15th, one-tenth inch. Eagle Rock, 15th, one-eighth inch; 21st, one-half inch; 28th, very thin; Boise City, 26th; Winnemucca, 11th, 19th.

PRECIPITATION.

The general distribution of rainfall for the month of September, 1881, is shown on Chart No. III, from the reports of over five hundred stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records (covering a period of many years) of Signal Service stations, and also a comparison of the present month with such averages. Upon examination of the chart it is found that the monthly rainfall is decidedly above the average throughout the central portions of the country, the regions of excess being most marked in the Upper Mississippi and Missouri Valleys. With the exception of Minnesota, these were the regions of considerable deficiency in August. Minnesota reports the largest excess (4.44 inches) that has occurred in that State since the establishment of Signal Service stations, and with the exception of an excess of 5.50 inches in the West Gulf States in 1875, is the largest ever reported by any district. The marked excess of 3.59 inches in the Upper Mississippi Valley is by far the largest ever reported by that district, the next highest, 2.35 inches, occurred in September, 1876. With regard to the Missouri Valley, the excess there reported, 3.03, is the largest since 1872, the next highest, 2.10 inches, occurred in 1876. Throughout the Atlantic coast States and reaching northwestward to include the Ohio Valley and the Lower Lake region deficiencies ranging from 0.43 inch to 2.61 inches occur. A slight deficiency is reported from the North Pacific Coast region, while the South Pacific Coast is normal. In the Plateau and Rocky Mountain regions the extremes are from 0.00 in Nevada to 3.80 in southeastern Arizona and southwestern New Mexico.

Deviation from average precipitation.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of Chart No. III. The following items of importance in connection with this subject were reported by voluntary observers:—*Connecticut:* Southington, monthly rainfall less than for any month since 1869. *Kansas:* Lawrence, monthly rainfall nearly double the average of the past thirteen years; during this period it has been exceeded but once, viz, in September, 1874. Yates Center, monthly rainfall, 7.80 inches above that of September, 1880; largest precipitation for several years. *Iowa:* Nora Springs, monthly rainfall exceedingly large, being nearly four times the average of the past six years. *Maine:* Gardiner, monthly rainfall 0.23 inch below the average of the past forty-five years. *Maryland:* Fallston, monthly rainfall considerably below the average; month unusually dry. Sandy Springs, month extremely dry; monthly rainfall below the average of the past fifteen years. *Massachusetts:* Springfield, there has been but three Septembers during the past thirty-three years in which the monthly rainfall was below that of September, 1881, viz, in 1855, 0.74 inch; 1865, 0.65 inch; 1877, 0.78 inch. *Missouri:* Saint Louis, the Missouri Weather Service reports: monthly rainfall 0.15 inch below the mean of the past forty-five years; heaviest precipitation, 10.53 inches, fell in September, 1866. *New Jersey:* Atco, monthly rainfall considerably below the average; month exceedingly dry. *Nebraska:* Nebraska Weather Service reports: average for the entire State, 4.14 inches, against 3.35 inches in 1880, and 2.20 inches in 1879; the average for September, 1881, has been exceeded but five times in the past thirty years; the monthly rainfall at Howard (12.96 inches) during the present month is the largest ever recorded in September in this State. *New York:* North Volney, monthly rainfall 1.68 inches below the average of the past nine years; during that period the largest precipitation (4.65 inches) occurred in 1870, and the smallest, 1.70 inches, was recorded in 1880.

Special heavy rains.—1st, Leavenworth, 2.60 inches. 2d, Toledo, 1.82 in 1 hour and 10 minutes. 4th, Moorehead, Minn., 2.57. 5th, Fort Union, N. Mex., 2.44; Fort Fetterman, Wyo., 2.60. 5th and 6th, Fort Wallace, Kans., 2.50. 6th, Yankton, 3.45; Smithville, Dak., 4.08. 6th and 7th, Fort Supply, Ind. T., 3.18. 9th, Smithville, N. C., 2.41. 9th and 10th, Neillsville, Wis., 4.30; Genoa, Nebr., 2.70 in 10 hours and 30 minutes. 11th, San Antonio, 3.09; Eagle Pass, 2.87. 13th, Charleston, 2.46; Decatur, 2.27; Fort Griffin, Tex., 2.76. 13th and 14th, Ashwood, Tenn., 3.90. 14th, Fort Macon, N. C., 2.68; Shreveport, 4.06; Ellsworth, N. C., 6.00 in 11 hours. 14th and 15th, Vicksburgh, 3.85; Pensacola, 5.62; Montgomery, 2.75; Mobile, 4.30; Fort Barrancas, Fla., 4.72; Fayette, Miss., 3.20; Auburn, Ala., 3.78. 15th, Nashville, 4.21; Grand Haven, 2.70; Memphis, 2.51. 15th and 16th, Niles, Mich., 2.43; Wytheville, Va., 3.11; Independence, Iowa, 2.15 in 7 hours; Highlands, N. C., 3.75. 15th to 17th, Ellsworth, N. C., 13.00 in 44 hours. 16th, Cedar Keys, 4.49; Aiken, S. C., 2.60. 16th and 17th, Augusta, Ga., 6.12. 17th, Marietta, Ohio, 2.35. 17th and 18th, Wytheville, Va., 2.20; Highlands, N. C., 4.05. 23d, Smithville, 2.24. 24th, Alpena, 2.50 25th and 26th, Mobile, 6.01. 26th, Dubuque, 4.01; Port Eads, La., 4.19. 26th and 27th, Elsworth, N. C., 4.00; Fort Brady, Mich., 2.83. 27th, Coldwater, Mich., 2.27. 27th and 28th, Highlands, N. C., 4.25; Pierce City, Mo., 4.20. 28th, Vevay, Ind., 2.40; Litchfield, Mich., 3.00; Fort Scott, Kans., 2.79; Fort Smith, Ark., 2.72. 28th and 29th, Manhattan, Kans., 3.27; Fort Snelling, Minn., 3.04; Howard, Nebr., 5.80 in 26 hours. 29th, Northfield, Minn., 2.43; Logan, Iowa, 2.40; Omaha, 3.67; Neillsville, Wis., 3.70; Saint Paul, 2.68; Duluth, 2.88; Nora Springs, Iowa, 4.00; Marquette, 4.44. 30th, Dubuque, 2.27; Fort Scott, Kans, 5.18 in 9 hours; Decatur, Tex., 4.44; Mason, 3.21; Springfield, Ill., 2.74; Jacksborough, 3.27; Brackettville, 2.52; Nelson, Tex., 4.00 in 1 hour and 30 minutes; Fort Gibson, 2.50; Brunswick, Mo., 2.50; Boonville, Mo., 3.18.

Largest monthly rainfalls.—Elsworth, N. C., 26.50 inches; Neillsville, Wis., 14.01; Highlands, N. C., 13.40; Nora Springs, Iowa, 13.05; Marquette, Mich., 12.71; Howard, Nebr., 12.36; Caldwell, Kans., 12.15; Mobile, 11.71; Embarrass, Wis., 11.60; Duluth, 11.52; Franklin, N. C., 11.35; Wellington, Kans., 11.19; La Crosse, 10.87; Key West, 10.71; Fort Snelling, Minn., 10.54; Northfield, Minn., 10.27; Dubuque, 10.26; Independence, Iowa, 10.20; Monticello, Iowa, 10.15; Cresco, Iowa, 10.03; Saint Paul, 9.95; Belle Plain, Kans., and Minneapolis, Minn., 9.90; Escanaba, 9.48; Fort Scott, Kans., 9.41; Independence, Kans., 9.11; Big Creek, Nebr., 9.01; Chamois, Mo., 8.93; Milan, Kans., 8.90, Fort Barrancas, Fla., 8.82; Yankton, Dak., 8.61; Fort Brady, Mich., 8.53; Pensacola, Fla., 8.47; Omaha, 8.36; Yates Center, Kans, 8.31; Smithville, N. C., 8.24; Madison, Wis., 8.17; Manitowoc, Wis., 7.85; Ames, Iowa, 7.63; Guttenburgh, Iowa, 7.50; Sedalia, Mo., 7.42; Cedar Keys, Fla., 7.41; Niles, Mich., 7.36; Evansville, Ind., 7.30; Port Eads, La., 7.24; Punta Rassa, Fla., 7.20; Argyle, Kans., 7.10; Auburn, N. H., 7.02; Augusta, Ga., 7.01; Leavenworth, 6.89; South Haven, Kans., 6.85; Corning, Mo., 6.73; Grand Haven, 6.71; Muscatine, Iowa, 6.59; Indianola, 6.51; Nashville, 6.49; Lexington, Mo., and Springfield, Ill., 6.43; Kansas City, Mo., 6.20; Alpena, 6.16; Mount Washington, 6.13; Vicksburgh, 6.11; Winfield, Kans., 6.10.

Smallest monthly rainfalls.—Anaheim, Brentwood, Brighton, Byron, Colton, Fort Yuma, San Gorgonio, Turlock, Stockton, Tracy, Summit, Martinez, Woodland, Menlo Park, Monterey, Modesto, Kingsburgh, Tulare, Sumner, Mojave, Ravenna, Newhall, San

Fernando, Spadra, White Water, Indio, and Mammoth Tank, Cal.; Pioche, Reno, Wadsworth, Beowawee, Elko, Halleck, Wells, Toano, and Tecoma, Nev.; Kelton, Promontory, and Terrace, Utah; Eagle Rock, Idaho, Terry's Landing, Mont., and Casa Grande, Ariz., none; Los Angeles, Livermore, Boca, and Antioch, Cal., and Fort McDermit, Nev., trace; Campo, Delano, and San José, Cal., 0.02 inches; Poway and Goshen, Cal., 0.03; San Diego and Solidad, Cal., and Browns, Nev., 0.04; Borden, Truckee, and Tuohey's Ranche, Cal., Yuma, Ariz., and Fort Washakee, Wyo., 0.05; Miles and Tennant, Cal., and Hot Springs, Nev., 0.08; Point San José and Visalia, Cal., and Eugene City, Oreg., 0.09; Salinas City, San Buenventura, Oakland, and Ione, Cal., Carlin and Golconda, Nev., 0.10; Otego, Nev., and Texas Hill, Ariz., 0.12; Caliente, Napa, and Pleasanton, Cal., and Palisade, Nev., 0.13; Merced, Cal., 0.14; Humboldt, Nev., 0.15; Battle Mountain and Winnemucca, Nev., and San Mateo, Cal., 0.16; Farmington and Presidio, Cal., 0.17; Lathrop, Cal., and Fort Bridger, Wyo., 0.18; Lemoore and Rio Vista, Cal., 0.20; Davis, Cal., 0.23; Bidwell, Galt, and Hollister, Cal., and Brookhaven, N. Y., 0.24; San Francisco and Alcatraz Island, Cal., and Boise City, Idaho, 0.25; Blue Creek, Utah, 0.29; Fort Gaston, Petaluma, Rocklin, Sacramento, and South Valejo, Cal., and Linden and Somerville, N. J., 0.30; Pajaro and Suisun, Cal., and Carson City, Idaho, 0.31; Tehachapi, Cal., 0.32; Gilroy, Cal., 0.34; Milton, Port Angeles, and Tehama, Cal., and Fort Keogh, Mont., 0.35; Corinne, Utah, and Williams, Cal., 0.37; Southington, Conn., 0.38; Santa Cruz, Cal., 0.39; Knight's Landing, Cal., 0.42; Salt Lake City, 0.43; Angel Island and Willows, Cal., 0.44; Belvidere, Ill., Catawissa, Pa., and Mount Ida, Ark., 0.45; Fresno, Cal., 0.46; Calistoga, Cal., 0.48; Maricopa, Ariz., White Plains, Cal., Delaware Breakwater, Del., New Brunswick, N. J., and Fort Douglass, Utah, 0.50.

Rainy Days.—The number varied in New England from 7 to 16; Middle Atlantic States, 4 to 13; South Atlantic States, 4 to 18; Florida Peninsula, 18 to 22; East Gulf States, 7 to 13; West Gulf States, 6 to 17; Rio Grande Valley, 5 to 11; Ohio Valley and Tennessee, 9 to 13; Lower Lake region, 9 to 16; Upper Lake region, 13 to 20; extreme Northwest, 5 to 15; Upper Mississippi Valley, 7 to 21; Missouri Valley, 12 to 17; Northern Slope, 6 to 10; Middle Slope, 3 to 7; Southern Slope, 4 to 8; Southern Plateau, 2 to 7; Middle Plateau, 0 to 3; Northern Plateau, 0 to 13; North Pacific region, 7 to 12; Middle Pacific region, 1 to 3; South Pacific region, 0 to 1.

Cloudy days.—The number varied in New England from 2 to 13; Middle Atlantic States, 1 to 10; South Atlantic States, 1 to 9; Florida Peninsula, 3 to 10; East Gulf States, 3 to 6; West Gulf States, 2 to 9; Rio Grande Valley, 2 to 10; Ohio Valley and Tennessee, 3 to 8; Lower Lake region, 2 to 11; Upper Lake region, 5 to 15; extreme Northwest, 5 to 10; Upper Mississippi Valley, 6 to 11; Lower Missouri Valley, 4 to 9; Northern Slope, 3 to 10; Middle Slope, 3 to 4; Southern Slope, 4 to 8; Southern Plateau, 1 to 5; Middle Plateau, 0 to 2; Northern Plateau, 2 to 8; North Pacific region, 4 to 8; Middle Pacific region, 0 to 1; South Pacific region, 0 to 4.

Snow.—Pagosa Springs, Colo., 6th, on mountains; Fort Shaw, Mont., 28th; Fort Assinnaboine, 27th; Fort Bridger, Wash., 6th, 27th, 28th, 29th; Fort Washakee, Wash., 5th, 6th, 29th; Genoa, Nebr., 16th, slight fall; Missoula, Mont., 19th, on surrounding mountains; Eagle Rock, Idaho, 2d, 3d, 25th, 29th; Dayton, Wash., 28th; Pomeroy, Wash., 27th; Winnemucca, 23d, on mountains; Salt Lake City, 23d, on mountains; Deadwood, 5th, 6th, 29th, 30th; Fort Meade, Dak., 6th; Cheyenne, 6th, 26th, 27th, 29th; Fort Custer, Mont., 30th; Deer Lodge, Mont., 24th, 29th; Fort Shaw, Mont., 28th; Helena, Mont., 29th; Fort Ellis, Mont., 24th to 26th, 29th, 30th; Superior City, Mont., 25th; Missoula Ferry, Mont., 10th to 16th; Fort Assinnaboine, Mont., 5th, 6th, 30th; Denver, 8th, on mountains; Saint Vincent and Moorehead, Minn., 4th; Omaha, 16th; Des Moines, 16th, between this city and Atlantic, several inches; Carson City, Nev., 22d, on mountains west of station; McGregor, Iowa, 16th, snow fell all day in the northwestern portion of the State, the storm moving from NW. to SE., and reaching eastward to Algona, Kossuth County, where it fell to the depth of four inches; Creston, Iowa, 16th, quite heavy; a general snow storm was reported from southern Minnesota; Stuart, Iowa, 16th, between this point and Avoca on the Rock Island Railroad, four to six inches reported.

Snow from a cloudless sky.—Cheyenne, Wyo., 29th, 3.55 p. m., lasting fifteen minutes.

Hail storms of unusual violence were reported as follows: Mankato, Minn., 2d, most violent ever known in this section; hailstones fifteen inches in circumference were picked up after the storm had passed; several persons were seriously injured by the falling hail. There was considerable wind and a perfect deluge of rain after the hail. Owatonna, Minn., 2d, wind shifted from northwest to south as the storm advanced, the hail breaking all windows on the south and west exposures. Lawrence, Kans., 29th, hailstones two inches in diameter fell in large quantities; every window on the north side of Massachusetts avenue broken; a heavy wind accompanied the hail, uprooting trees and unroofing some buildings. Moorehead, Minn., 4th, hailstones one inch in diameter, breaking all windows having western exposure. Morgantown, 1st, hailstones one-fourth inch in diameter.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 74 to 89; Middle Atlantic States, 64 to 87; South Atlantic States, 68 to 82; East Gulf States, 67 to 78; West Gulf States, 52 to 77; Rio Grande Valley, 68 to 80; Ohio Valley and Tennessee, 65 to 73; Lower Lake region, 67 to 72; Upper Lake region, 70 to 82; extreme Northwest, 66 to 79; Upper Mississippi Valley, 62 to 80; Missouri Valley, 66 to 78; Northern Slope, 46 to 66; Middle Slope, 45 to 61; Southern Slope, 53 to 71; Southern Plateau, 47 to 60; Middle Plateau, 25 to 34; Northern Plateau, 37 to 67; North Pacific region, 69 to 81; Middle Pacific region, 40 to 77; South Pacific region, 49 to 73.

WINDS.

The prevailing winds during the month of August, 1881, at Signal Service stations, are shown on Chart No. II by arrows which fly with the wind. In the South Atlantic and Gulf States, including Texas, southeasterly; Middle Atlantic States and New England, southeast to southwest; Lake region and Southern Plateau, southerly; Eastern Rocky Mountain slope, northwesterly; Northern and Middle Plateau and the Pacific Coast regions, westerly.

Total movements of the air.—The following are the largest total movements at the Signal Service stations: Mount Washington, 25,957 miles; Fort Sill, Ind. T., 10,565; Dodge City, 10,137; Delaware Breakwater, 10,039; New Shoreham, R. I., 9,884; Chincoteague, Va., 9,837; Henrietta, Tex., 9,751; North Platte, 9,645; Fort Elliott, Tex., 9,165; Eagle Rock, Idaho, 8,968; Decatur, Tex., 8,887; Cape May, 8,874; Portsmouth, N. C., 8,563; Kitty Hawk, 8,553; Concho, Tex., 8,375; Hatteras, 8,336; Indianola, 8,306; Barnegat, 8,272; Sandy Hook, 8,201; Port Eads, La., 8,199; Cape Henry, 8,194; Sandusky, 8,072; Huron, Dak., 8,039. The smallest are: La Mesilla, N. Mex., 864; Phœnix, 1,102; Lynchburgh, 1,351; Silver City, N. Mex., 1,468; Memphis, 1,873; Augusta, Ga., 1,964; Lewiston, Idaho, 1,978; Florence, 2,021; Roseburgh, 2,253; Tucson, 2,348; Visalia, 2,367; Missoula, Mont., 2,433; Montgomery, 2,525; Brownsville, Tex., 2,541; Morgantown, 2,590; Knoxville, 2,629; Springfield, Mass., 2,652; Campo, Cal., 2,692; Nashville, 2,696; Olympia, 2,734; El Paso, 2,834.

High winds.—Winds of 50 miles per hour and over were reported as follows: On summit of Mount Washington, 1st, 5th to 9th, 11th, 15th, 19th to 28th, 30th; maximum velocities of 90 miles NW., occurred on 1st, 22d, 23d; Duluth, 78, NE., 16th; Wilmington, 64, W., 9th; Smithville, 60, NE., 9th; Eagle Rock, 55, SW., 24th; Grand Haven, 54, SW., 4th; Cedar Keys, 50, S., 24th; Dodge City, 50, W., 10th; Fort Assinniboine, 50, W., 24th; Macon, 50, SE., 9th; Moorehead, Minn., 50, NW., 4th.

Local storms.—Wilmington, N. C., 9th, most violent storm for many years; signals were ordered up at 9.30 a. m. with a telegram from the Chief Signal Officer to the effect that a hurricane was central on the North Carolina coast which would probably move northward. At 9.45 a. m. barometer fell to 29.805; 10.45 a. m., 29.626; 10.56 a. m., 29.620; 12 m., 29.390; 1 p. m., 29.302; 2 p. m., 29.502; 2.56 p. m., 29.694. Storm center passed station at 1 p. m., when the wind veered from east to southwest and west, suddenly increasing from a gale to 90 miles per hour and continuing at that velocity for about five minutes when the connections of the anemometer were broken. Many buildings were unroofed and demolished and trees and fences generally leveled to the ground. Loss estimated at $100,000. No such storm since the years 1822 and 1838 when, according to report, the destruction of property was very great. Maryville, Mo., 29th, during the night town visited by a violent southwest wind storm; the large smoke-stacks of the woolen mills and Wabash elevators blown down, also the ticket office, amphitheater and 600 feet of the new stables on the grounds of the Fair Association; throughout the city houses were unroofed, trees uprooted, and numerous outbuildings destroyed. Wrightsville, N. C., 9th, 5.30 a. m., indications of a very severe storm which had been threatening for some days; 7 a. m., wind became brisk, and by 8 a. m. boats were drifting away and marsh hens were flying; 9 a. m., tide marked a height never before witnessed; water washed over the turnpike carrying large quantities of earth out to sea, and rendering the road impassable; some bath-houses were washed away and others destroyed; 11 a. m., wind blew with extreme violence, uprooting trees and sweeping away the grand stand at the Banks; 12 m., wind shifted from east to southwest and west, blowing with redoubled fury, crushing buildings and tearing up the largest trees. Smithville, N. C., 9th, most violent storm for past fifty years; town covered with fallen trees, scattered fences, and the *débris* of demolished buildings; all pilot-boats in the harbor were sunk, and loaded vessels driven ashore; at 10 a. m. a maximum velocity of 60 miles per hour from the NE., barometer fell to 29.22, lowest; rising rapidly thereafter as the storm center passed; 5.30 p. m., storm abated. Augusta, Ill., 24th, 4 to 5 p. m., several buildings leveled to the ground, trees uprooted, and fences scattered; considerable loss to farm property. Golden, Ill., 24th, 5 p. m., violent northwest storm unroofing houses, uprooting trees, and causing much other damage. Dutch Town, Ill., 24th, 4.30 p. m., the village, consisting of six houses, one church, and a school-house, was entirely destroyed; loss about $8,000. Port Byron, Ill., 24th, 4 p. m., heavy wind storm of about five minutes' duration; trees, fences, and several frame buildings were demolished; two of the principal business blocks were unroofed; track of storm less than a mile wide. Joliet, Ill., 24th, 4 p. m., most destructive ever known; several buildings demolished and many more unroofed; one bridge destroyed and another badly damaged; loss from $7,000 to $10,000. Clayton, Ill., 24th, 5 p. m., telegraph lines down in all directions; tornado passed three miles to the northeast of station, sweeping everything before it; in the village signs, awnings, fences, and chimneys were destroyed. Camden, Ill., 24th, 5 p. m., tornado passed from SW. to NE. through the town, containing 200 inhabitants, completely demolishing every building and killing two persons; "it was the work of an instant." Coatsburgh, Ill., 24th, city considerably damaged by a violent storm of wind and rain, which passed over about 4.30 p. m. Ursa, Ill., 24th, violent wind storm, wrecking trees, fences, and outbuildings. Marcelline, Ill., 24th, trees uprooted and fences, signs, and awnings scattered; storm passed in a northeasterly direction. Nebraska City, Nebr., 29th, 5 p. m., violent tornado passed over the village from SW. to NE., destroying several buildings and unroofing the Blind Asylum and several stores. Madison, Nebr., 29th, during the night a large portion of the town, containing 1,000 inhabitants, was destroyed by a tornado moving in a northeasterly direction. This was probably the storm which visited Stanton, situated to the east-northeast, on the Sioux City Railroad. Oswego, Kendall County, Ill., 29th, very violent wind storm passed in a northeasterly direction over the southwest portion of the county, causing great destruction of farm property, principally barns, corn-cribs, cattle-sheds, and orchards; path of storm narrow and often of peculiar shape. Farmersville, Jasper County, Iowa, 29th, violent wind storm from the southwest; twenty miles south of station, passenger train wrecked by the gale; all telegraphic communication between this station and Fort Dodge cut off. Iowa Falls, Hardin County, Iowa, 29th, several freight cars thrown over by the force of the wind, obstructing all travel; considerable destruction in surrounding country; this storm was quite severe at Ackley in the same county. Des Moines, 29th, heavy squall, blowing down trees and outbuildings. Caldwell, Kans., 29th, several houses were entirely demolished and other buildings more or less injured; no such storm has visited this section in several years. Mantonia, Wis., 29th, a violent tornado swept down a valley a short distance west of the town, completely devastating a space eighty rods wide and about six miles in length; many houses, barns, outbuildings, and one grist-mill were demolished; twelve persons were serioulsy injured, but none killed outright; loss estimated at $60,000. Wellsville, Pa., 2d, many buildings blown down, trees uprooted, and live stock killed; heavy damage was reported from northern portion of State and in southwestern New York. Dyck's Switch, N. Y., 2d, heavy northwest storm, several buildings unroofed and considerable loss to railroad property. Ackley, Iowa, 30th, violent wind storm unroofing several buildings, destroying fences and uprooting trees. Eldora, Iowa, 29th, Reform School building blown down, and much other damage caused. Manhattan, Kans., 29th, 6 p. m., violent tornado 3½ miles east of station; storm passed in a northeasterly direction on the south side of the Kansas River; several houses were entirely demolished and considerable timber destroyed. Winterville, Ga., 15th, violent wind storm, tearing up trees, scattering fences, and destroying cotton; several buildings more or less damaged. Quincy, 24th, 5 p. m., twenty-one buildings demolished and about fifty unroofed, trees uprooted, fences torn down, and telegraph communication completely cut off; nine persons were killed by falling *débris;* track of storm about two miles wide; streets of city thickly strewn with *débris;* storm accompanied by terrific thunder and lightning; loss estimated at $100,000. Abilene, Kans., 29th, throughout the day Dickinson County experienced the strangest weather ever known in the State; dense and threatening clouds would roll up in different parts of the heavens as if by magic accompanied by fitful gusts of wind, some of which were of extreme violence; at noon the storm came up with unusual power, blowing in windows, destroying chimneys, and unroofing buildings; Presbyterian church entirely demolished; losses estimated at $15,000. Centralia, Boone County, Mo., 29th, violent wind storm passed from southwest to northeast five miles south of station; several buildings demolished and two persons killed. Yuba, Traverse County, Mich., 24th, violent northwest storm, unroofing buildings, scattering fences, and blowing down trees; at Kingsly station several buildings blown down, causing a loss of several thousand dollars. Petoskey, Mich., 24th, much timber blown down, in some cases obstructing railroad travel; outbuildings and fences generally destroyed in the path of the storm. Duluth, 16th, 8 a. m., violent northeast storm, maximum velocity at 9.15 a. m., 78 miles per hour, continuing for fifteen minutes, while for four hours the wind blew at an average rate of 41 miles per hour, throwing the waves of the lake into mountainous seas, the spray in some instances rising to the height of 104 feet. The old light-house was destroyed by the waves and the wharves badly damaged. At the junction of First avenue and the railroad-switch yards the waves rushed over the piers, carrying huge pieces of stone and drift-wood which blocked up the tracks so that railroad travel was suspended for some time. The tracks of the Saint Paul and Duluth Railroad were completely buried beneath a mass of drift-wood and rocks; nine car-loads of flour were badly damaged and the oil-house near the depot buildings totally destroyed. The damage to buildings along Minnesota Point was quite severe; eight or ten buildings were moved from their foundations and several entirely washed away. One million feet of logs at Gray's Mill were swept out by the waves. This storm proved to be the most violent within the memory of the oldest inhabitants of the city. The two most destructive storms since the advent of railroads occurred on November 13, 1872, maximum velocity 36 miles, and October 16, 1880, maximum velocity 30 miles per hour. These winds were from the NE., and therefore more destructive as compared with other much higher velocities, but not from the right direction to cause much damage. Holt County, Mo., 26th, 5.30 p. m., tornado crossed the Missouri River in section 27, township 60, range 29 N., passing from SW. to NE. over the Big and Little Tarkio Rivers, thence through the town of Maitland, thereafter crossing the Nodaway River and moving some distance in Nodaway County. Farms in the path of the storm were wrecked of everything, and at many places where the whirling cloud touched the ground the latter had the appearance of being washed, the stubble and grass being bent toward the northeast or in the direction of the moving storm-cloud. At the town of Maitland, buildings were moved from their foundations and several unroofed. Clare, Clare County, Michigan, 22d, terrific hurricane during the night accompanied by violent thunder and lightning; great damage to property over a wide extent of country. In vicinity of Atwood's stations over 2,000,000 feet of timber were blown down; trees were "snapped off like pipe-stems" and the work of destruction was awful in its suddenness and completeness. Lansing, Ingham County, Michigan, 22d, very violent wind-storm with terrific lightning; property destroyed to the value of $25,000. Elmira, N. Y., 25th, gale lasted about two minutes, during which time it unroofed a large hotel, carried the roof of the palace-car shops over and several hundred feet beyond the adjoining freight building. Many houses were unroofed and windows blown out, church steeples thrown over and trees uprooted or broken off close to the ground. Rain fell in torrents, increasing the already serious loss of property. Owatonna, Minn., 29th, most destructive storm in the history of this region; about 100 small structures were more or less damaged; loss estimated at $10,000. Wautoma, Wis., 29th, about 5 p. m. violent tornado passed near station from SSW. to NNE. through the counties of Washara and Waupaca. Preceding the storm, clouds in the western heavens, looking like great sheets of white smoke, were dashed about in the wildest manner, and finally combining in a long spout-like mass, descended to the earth, over which it moved with great speed. Houses, barns, and out-buildings in the path of the storm were completely torn to pieces; fences were strewn over the woods, corn-fields swept clean, hay and grain stacks destroyed and the largest trees "snapped off like pipe-stems;" whole destruction consumed about fifteen minutes. Width of storm path 80 rods, length 12 to 15 miles. In passing over Sandbar Lake the storm formed a water-spout which carried up a great quantity of water and considerable fish upon the adjoining land. Stanton, Stanton County, Nebraska, 29th, about 9 p. m., tornado passed from SW. to NE., destroying a portion of the town; storm came up with a rushing, roaring noise like a heavy stock train and passed through the village with lightning rapidity; "it was gone in an instant." People were crazed by the sudden and awful awakening from slumber, and many were stripped of clothing, drenched with rain, and severely injured by flying *dêbris*. Ten houses were completely leveled to the ground; path of storm about 300 yards wide. Emporia, Kans., 29th, 6.30 p. m., north and west of this city a terrible wind-storm passed from WNW. to ESE. down the valley of the Neosho, destroying an immense amount of farm property and killing four persons; 42 buildings were completely demolished and 10 to 15 more or less injured. Most destructive storm since the terrible tornado of 1878, and passed over about the same path as the tornado of June, 1881. Between Emporia and Howard the storm expended itself in an unusually heavy fall of rain, accompanied by the most terrific display of lightning. At one place in the storm's path a flock of sheep valued at $5,000 were all killed. Width of track from 3 to 100 rods; through the timber on Neosho River 30 rods. Lind, Wis., 29th, about 7 p. m., tornado, doing a vast amount of damage in town and country; in the former five buildings were completely blown to pieces and several others badly damaged. Centralia, Nemaha County, Kansas, 29th, about 6 p. m., violent wind-storm five miles south of station; several buildings and much farm property destroyed.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for September, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 86.47 per cent. The percentages for the four elements are: Weather, 89.94; Direction of the Wind, 80.80; Temperature, 89.21; Barometer, 85.59 per cent. By geographical districts they are: For New England, 83.42; Middle Atlantic States, 87.61; South Atlantic States, 90.12; Eastern Gulf States, 91.08; Western Gulf States, 92.47; Lower Lake region, 84.98; Upper Lake region, 84.19; Tennessee and the Ohio Valley, 86.57; Upper Mississippi Valley, 83.87; Lower Missouri Valley, 78.62; Northern Pacific Coast region, 90.90; Central Pacific Coast region, 100.00; Southern Pacific Coast region, 100.00. There were 77 omissions to predict (47 being due to the absence of reports from the Pacific coast) out of 3,690, or 2.08 per cent. Of the 3,613 predictions that have been made, 111, or 3.07 per cent., are considered to have entirely failed; 131, or 3.63 per cent. were one-fourth verified; 371, or 10.27 per cent. were one-half verified; 373, or 10.32 per cent. were three-fourths verified; 2,627, or 72.71 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—Seventy-seven cautionary signals were displayed during the month, of which 63, or 81.82 per cent. were fully justified by winds of 25 miles per hour or over, at or within a radius of 100 miles of the station. Two off-shore signals were displayed, neither of which were fully justified; one was justified as to direction only, and the other failed with regard to both direction and velocity. Seventy-nine signals of both kinds were displayed, of which 63, or 79.75 per cent., were fully justified. The above does not include signals ordered at display stations where the velocity is only estimated. Seventy winds of 25 miles or over were reported for which no signals were ordered. Twenty signals were ordered late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water, as observed at Signal Service stations during the month of September, 1881. Throughout the month the principal rivers of the country have been extremely low, a remark which applies with equal if not greater force to the previous month of August. Comparing the highest readings of the gauge for the month of August with those of September, it is found that the following changes have taken place during the latter month: Red River, +7 inches; Arkansas, —1 foot 9 inches; Missouri, from —2 feet 1 inch to —2 feet 7 inches; Mississippi, —13 feet 8 inches to +8 feet 10 inches; Ohio, —1 inch to —3 inches; Cumberland, +9 inches; Tennessee, +3 feet 2 inches; Monongahela, —1 inch to —1 foot 3 inches; Savannah, +5 feet 5 inches; Williamette, —4 feet 6 inches to —5 feet; Sacramento, +1 inch. At but two stations did the water approach the danger line, viz, Keokuk and Davenport.

Floods—Kansas:—Caldwell, 29th, heaviest rain for years, over 14 inches fell in ten hours; trains delayed by serious washouts; creeks and rivers overflowed, causing great damage to bridges, fields, and highways. Eureka, 29th, rainfall immense and almost unparalleled; all streams overflowed; railroad and highway bridges damaged. Emporia, 29th, heaviest rainstorm ever seen in this section; streets flooded in half an hour, causing considerable damage to property. Sumner County, 29th, in the southern portion, heaviest rain for several years; at Wilmington rain continued for seven consecutive hours, 7.45 inches falling in that time; creeks and sloughs overflowed, submerging the bottom lands for miles; haystacks and corn crops damaged to a considerable extent. *Missouri:* Kansas City, 29th, 3 p. m., terrific storm of wind and rain, lasting about two hours; water filled the streets, which, in a short time, resembled small rivers. Basements were flooded, streets badly cut, and embankments carried away. Railroad tracks covered with *débris* from falling walls and embankments, to such a degree as to prevent all travel for some time. Loss to private and city property about $20,000. *Minnesota:* Spirit Lake, 16th, all railroad travel suspended by heavy washouts; very heavy rains for the past two days. Saint Paul, 29th, all rivers and smaller streams flooded by the continued heavy rains; trains on the various railways delayed by washouts and land slides. At Minneapolis there was a jam of 20,000,000 feet of logs in the Mississippi, greatly endangering contiguous property. On the Minnesota the low lands were flooded on both sides of the river, causing great loss to the hay crop. Marine, 29th, mill-dams carried away by the high water; bridges over Brown's Creek and Fairy Hall Creek washed out; lowlands flooded. *Michigan:* Marquette, 29th, heavy washouts on railroads. Escanaba, 26th, streets badly washed and cellars flooded to depths of from 2 to 3 feet. *Nebraska:* Omaha, 29th, streets badly washed and basements flooded; high winds breaking down trees and scattering fences. *Texas:* San Antonio, 10th, streets flooded; creeks and rivers overflowed. *New York:* Elmira, 25th, rain fell so heavily that the sewers were unable to take the water off and immense damage was done to household goods by the water backing up and into the houses. *North Carolina:* Elsworth, much damage done the Western North Carolina Railroad by the remarkably heavy rains of the 14th to 17th; several land slides on the mountain section and heavy washouts delayed all railroad communication until the 20th; monthly rainfall 26.50 inches. *Wisconsin:* Wausau, 29th, highest water ever known in the Wisconsin River, water rose at the rate of 4 inches an hour during the day; river 21 inches higher than the June flood of 1880; rainfall during twenty-four hours over 7 inches: 2,000,000 feet of logs washed away, together with a large quantity of lath and shingles; several houses washed away; all business suspended. La Crosse, 29th, all small streams flooded; in Coon Valley the damage from high water is very heavy; all country bridges washed away; farmers have been unable to thresh and grain is sprouting in the stacks, which have been greatly damaged by water. Stewart, 29th, more water on the ground than at any time previous during the year; grain stacks nearly ruined by the continued driving rain.

Drought.—Connecticut: Southington, 20th, vegetation suffering severely; great scarcity of water. *Florida:* Houston, 30th, month very dry, all kinds of crops suffering for want of rain. *Indiana:* Vevay, 6th, Ohio River lower than ever known before. *Kentucky:* In central and eastern portions of State, 3d, no rain in past six weeks. *Maryland:* Fallston, 30th, month remarkably dry, many crops have entirely failed, while all have suffered severely. Sandy Springs, 30th, vegetation suffering from an unprecedented drought. Woodstock, 30th, wells and springs very low, crops suffering. *Michigan:* Sanilac County, 17th, drought has been excessive and the effect upon crops very serious; the air is filled with dust and smoke, and all vegetation is parched. *New Jersey:* Trenton, 2d, crops and cattle suffering from drought which extends the whole length and breadth of the State. In the northern part of Hudson County, where water supply is entirely derived from wells, the residents are compelled to haul water from Jersey City and Hoboken and pay as high as $10 a load. The North Hudson Railroad Company, who have 600 horses at West Hoboken, cart all their water in large iron tanks. From Burlington County it is reported that the Delaware and all the neighboring streams are unusually low; wells, cisterns, and springs are nearly exhausted; corn crops and pastures are burning up; not even a vestige of green can be seen in many fields. Cape May, 4th, crops suffering severely; farmers report vegetables to be almost burned in the ground. Freehold, 30th, surrounding country very dry; crops below the average. *New York:* Buffalo, 2d, very severe, farm products are very poor and short of the usual crop. Rochester, 2d, grass and pastures are burned up and fruit is suffering severely; wells and streams dry; the surrounding country in great distress. McKean and Allegany Counties, 3d, 1,000 oil wells shut down for lack of water to run engines; no rain has fallen for over a month. Albany, 3d, unless rain soon falls it will be difficult to foretell the result of the terrible and unprecedented drought now prevailing. A drought so general and devastating has never been known in this country before. For miles about the streams, wells, and cisterns are dry and water is brought from distant places and sold by measure in various places; fruit is falling from the trees prematurely ripened and decayed; pastures are parched and there is no nutriment in grass of any kind; leaves are coloring and falling as in the fall; potatoes are being dug to prevent rot, and other crops are withering or rotting in the fields; streams are lower than ever known before, and navigation is seriously impeded; railroads find it difficult to run trains, owing to the lack of water for steam and in consequence there are daily serious blockades of freight on the New York Central Railroad. Troy, 3d, the numerous industries of the town suffering great inconvenience from lack of water; there is one-third falling off in the amount of work turned out in the linen and iron manufactories; all the streams run dry and several kinds of work suspended. In most instances people at the south end of the city are compelled to take water for domestic purposes from the almost stagnant ponds in the vicinity. Water very low in the Waterford level of the Champlain Canal owing to the scarcity of water in the Mohawk River; boats frequently aground; lowest water for many years. Westchester County, 29th, drought is paralyzing business, it is the most disastrous ever experienced; all vegetation is parched and nearly devoid of life; grass is brown and dead, trees are leafless, and gardens and fields look like deserts; in some places the earth is as dry as powder to a depth of six feet, and when a breeze passes over it the air is like the current from a hot oven; cattle have become thin and sickly from lack of sufficient food; not a ton of corn-fodder has been raised in the county. The county is practically without water; wells and springs, never known to fail before, are now dry; the Bronx River has ceased to run; on the principal streams of the county, Byram, Cross, Sawmill, and Croton Rivers, all business suspended; small creeks and brooks gave out several weeks since; cattle are driven 3 to 5 miles for water, and then only that which is stagnant can be obtained. Villages are especially suffering from drought; water is drawn from a distance in barrels and sold to the consumer. At White Plains, Mount Vernon, Pleasantville, Kensico, Scarsdale, Mount Kisco, Katonan, Croton Falls, Chappaqua, and other smaller villages water is hauled from the neighboring rivers, which are now nearly dry. Croton Lake is very low and New York City is compelled to draw upon the storage reservoirs at Lake Mahopac and upon the upper reservoirs in Putnam County.

Daysville, 19th, wells, cisterns, and most of the streams entirely dry. Hannibal, 17th, the most terrible drought that ever visited this section; grass virtually dead; no food for stock except what has been stored for winter; wells and streams dry, people and animals suffering for water. *North Carolina:* Life-saving station, No. 6, 30th, the long-continued drought has had a marked effect upon the sea-coast. The beach grass, affording an immense pasturage for thousands of cattle, has prematurely dried up, rendering the removal of the stock absolutely necessary before winter. Good drinking water cannot be obtained, that drawn from wells having a decided brackish taste. Corn and vegetation has generally failed. A serious type of sore-throat has made its appearance, resulting fatally in nearly every instance; it is attributed to the extreme aridness of this section. The numerous creeks and ponds on the south side have stagnated, causing an unprecedented spread of malarious and climatic fevers. Kittyhawk, 30th, very severe during the month. Hatteras, 2d, great suffering for rain. *Ohio:* Leetonia, 10th, a most terrible drought still continues, the earth is baked and vegetation withered; no such weather ever experienced before. The sun appears like a large ball of fire suspended in the heavens, and the atmosphere is heated to a degree almost intolerable; schools have been closed until the 1st of October, and the rolling-mills and tool works have suspended operations because of the excessive heat and unprecedented lack of water. Columbus, 9th, the extreme drought causes great suffering; city enveloped in smoke. *Pennsylvania:* Catawissa, 30th, owing to long-continued drought trees are generally dying; pastures destroyed and farmers are feeding their cattle with hay; fall seeding delayed; the earth is like an ash heap to the depth of four feet; the north branch of the Susquehanna is five inches lower than the lowest point ever before recorded; small brooks that have never failed are now dry. Fallsington, 30th, wells, springs, and small streams are generally dry; farmers have not put in their fall wheat owing to the baked condition of the soil. In the northwestern portion of the State, which is principally a dairy country, the loss to crops and dairy interests can hardly be estimated; corn will yield about half a crop, grapes about one-third, and other small fruits are drying up or rotting on the trees. Erie, 5th, stock suffering severely; crops seriously damaged; many small streams entirely dry. *Tennessee:* Chattanooga, 12th, river lower than at any time since 1839; crops seriously damaged. 13th, river reached zero point on gauge corresponding with the low water mark of 1839, which is the lowest ever known at this point. Memphis, 30th, correspondence of the cotton exchange in this and neighboring States report very unfavorable prospects for the cotton crop, owing to the severe drought. *Virginia:* Fredericksburgh, 2d, unprecedented in the history of northern Virginia; in some places rain has not fallen for three months; there is no food for cattle, and in some cases people have traveled 30 miles for feed. On the upper Rappahannock water is hauled long distances for household uses. Fort Myer, 10th, crops in surrounding country greatly injured from drought.

Water-spouts.—Key West, 10th, 1.20 p. m., two water-spouts were seen 7 miles WNW. from station, moving from E. to W.; one was complete, extending from a cumulo-stratus cloud to the water; the other was from the same cloud, but was only partially formed; it descended from the cloud but did not connect with the water; the phenomenon lasted for twenty-five minutes. Hatteras, N. C., 4th, 12 m., a large water-spout was observed in the sound, about three miles north of station. When first observed, it was fully formed and extended from a heavy cumulo-stratus cloud, of black appearance, to the water, apparently a distance of half a mile. The spout was of a light grayish color near the water and of much darker color near the cloud; the water at its base seemed much agitated and was raised to a height of from 3 to 4 feet for several rods around. The water could be distinctly seen ascending the spout rapidly, with a spirally upward motion. The spout lasted for five minutes, when it broke; ten minutes elapsed before the column was fully drawn up and had disappeared within the cloud.

High tides.—Indianola, 28th, 29th, 30th; Portsmouth, N. C., 3d, 13th; New Haven, 9th, 10th.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which ovservations were taken, is given in the table on the left-hand side of Chart No. III. Owing to loss of instrument, observations at Charleston are wanting on the 9th, and from the 24th to the 30th.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—In the various districts they were reported as follows: New England, 1st to 7th, 11th, 13th, 22d to 24th, 26th to 29th; Middle Atlantic States, 1st to 3d, 5th, 9th to 12th, 22d, 23d, 25th to 29th; South Atlantic States, 3d, 4th, 7th, 9th, 11th, 12th, 13th, 17th, 26th, 27th; Eastern Gulf States, 8th, 10th to 19th, 26th to 28th; Florida

Peninsula, 1st to 7th, 10th to 16th, 19th, 21st, 22d to 27th, 30th; Western Gulf States, 1st, 6th to 10th, 12th, 13th, 27th, 29th, 30th; Rio Grande Valley, 1st, 6th, 7th, 8th, 10th, 11th, 13th, 27th, 29th, 30th; Ohio Valley and Tennessee, 1st to 4th, 8th to 11th, 13th, 14th, 18th, 19th, 21st, 23d to 28th; Lower Lake region, 1st to 5th, 9th, 10th, 12th, 22d to 27th; Upper Lake region, 1st to 6th, 8th to 10th, 14th to 18th, 21st to 30th; Upper Mississippi Valley, 1st to 12th, 14th, 15th, 21st to 30th; Missouri Valley, 1st to 6th, 9th to 15th, 19th, 22d to 30th; extreme Northwest, 3d, 4th, 9th, 11th, 13th, 19th, 20th, 24th; Northern Slope, 1st to 4th, 18th, 19th, 21st to 23d, 28th, 29th; Middle Slope, 1st, 5th, 6th, 9th, 18th, 22d, 23d, 25th, 26th to 29th; Southern Slope, 5th, 6th, 12th, 26th to 29th; Southern Plateau, 3d, 4th, 10th to 13th, 28th; Middle Plateau, 23d; Northern Pleateau, 2d, 4th, 8th, 13th, 17th, 24th; North Pacific Coast region, 4th, 8th, 17th, 22d, 23d; Middle Pacific Coast region, 1st, 2d, 21st to 27th.

Atmospheric electricity interfering with telegraphic communication.—Dodge City, Kans., 29th; Fort Elliott, Tex., 28th; Jacksborough, Tex., 7th, 27th, and 29th; Eagle Pass, Tex., 8th and 29th; Brackettville, Tex., 30th; Bismarck, Dak., 19th.

Zodiacal light.—Nashville, 5th, 6th, 11th, 12th, 16th, 17th, 19th to 25th and 30th; Wood's Holl, Mass., 15th and 16th; New Corydon, Ind., 21st, 22d, 24th, 26th, 27th, and 30th; Monticello, Iowa, 1st.

Auroras.—The most remarkable display for several years occurred on the 12th, 13th and 14th, and the line of observation was continuous from Sydney, N. S., westward to Umatilla, Oreg. Observers reported its appearance as far south as Louisville and northward to Saint Vincent, Minn. At several stations in Dakota and Minnesota the display began on the 11th, and probably on this date the districts eastward to the Atlantic would have reported the same phenomenon had it not been for the heavy cloudiness which prevailed from the Lake region eastward to Newfoundland, accompanying the progress of low area No. II. It is interesting to note in connection with this great electrical disturbance that on precisely the same dates, but during the previous month of August, a remarkable auroral display was observed very extensively in England and Scotland. An observer at the Stonyhurst Observatory describes it as recalling the magnificent displays of 1869, 1870, and 1872, while the play of the magnets was one of the most violent ever recorded at that observatory. On the 11th, 12th, and 13th of August observers of the sun found indications of intense commotion; sun-spots were numerous, large, and active, and protuberances shot up from the sun's surface with increased force and velocity. The earth appeared to make instantaneous response to the solar storm and a magnetic disturbance suddenly commenced by an unusual exhibition of earth currents. At the Greenwich Observatory no such magnetic disturbance had been recorded for many years. This auroral display was not only very extensive but exceedingly brilliant, and many of its manifestations wonderfully strange; in the United States but two stations reported, viz, Duluth, 13th, 11 p. m.; Saint Vincent, 12th, 10 p. m. Concerning the display for the present month (September) the following stations, with few exceptions, report the time of appearance and disappearance; Sydney, C. B. I., 14th. Halifax, N. S., 13th, 14th. Eastport, Me., 12th, from 8 to 11 p. m.; 13th, from 8 to 10 p. m.; 14th, from 7 to 9 p. m. Bangor, Me., 12th, from early dusk until midnight. Cornish, Me., 14th. Dexter, Me., 12th, 7 to 9 p. m.; 14th, 8 to 10 p. m. Mount Washington, N. H., 12th, 7 to 10.20 p. m.; 13th, 1.10 to 4 a. m., and from 7 to 8.40 p. m. Burlington, Vt., 12th, 7.15 to 9 p. m.; 14th, 8.30 to 10.30 p. m. Newport, Vt., 12th, 8 to 9 p. m. Boston, 12th, 8 p. m. Newport, R. I., 12th, 7.30 to 8.30 p. m.; 13th, 1 a. m. to daybreak. New London, 12th, 9 to 9.45 p. m.; 13th, 2.10 to 2.38 a. m. New Haven, 12th, 7 to 9 p. m.; 13th, 1 to 3 a. m., also at 8 p. m. Cambridge, Mass., 12th, 8 to 8.45 p. m. Rowe, Mass., 12th, 8.30 to 9.30 p. m. Amherst, Mass., 12th, 9 p. m. Williamstown, Mass., 12th, 8 p. m.; 13th, 8 p. m.; 14th, 8.15 p. m. Albany, 12th, 8 p. m. to morning of the 13th. Oswego, 13th, 1 a. m. Waterburgh, N. Y., 13th, 9 p. m.; 14th, 8 to 9 p. m. Ardenia, N. Y., 8 to 9 p. m. Rochester, 13th, 2 a. m. to daybreak. Buffalo, 13th, 1.30 a. m. Dyberry, Pa., 12th, 8.15 p. m. West Chester, Pa., 12th, 8 p. m. Fallsington, Pa., 12th, 8.15 to 9 p. m. Philadelphia, 12th, 8 p. m. Moorestown, N. J., 12th, 8.30 p. m. Freehold, N. J., 12th, 8 to 8.45 p. m. Atco, N. J., 12th, 8.30 p. m.; 13th, 9 p. m. Contoocookville, N. H., 12th, 8.30 to 9 p. m. Fallston, Md., 12th, 8 to 9 p. m. Woodstock, Md., 12th, 7.45 to 8.45 p. m. Fort McHenry, Md., 12th, 9 p. m. Accotink, Va., 12th, 8 p. m. Fort Myer, Va., 12th, 7.30 p. m. Washington, D. C., 12th, 7.40 to 9 p. m. Morgantown, 12th, 8 to 9.30 p. m. Erie, 13th, 12.50 to 2.40 a. m. Toronto, 12th, 13th. Cleveland, 12th, 8 p. m.; 13th, 2 to 4 a. m. Detroit, 12th, 7.20 to 11 p. m.; 13th, 12.20 a. m. to daybreak. Sandusky, 12th, 11.30 p. m. to 4 a. m. of 13th. Toledo, 12th, 7.50 p. m.; 13th, 3 to 4 a. m. North Lewisburgh, Ohio, 12th, 8 p. m. Westerville, Ohio, 12th, 8 p. m. Wooster, Ohio, 12th, 8 p. m. Columbus, 13th, 12.10 to 1.35 a. m. Alpena, 12th, 8.30 p. m. to 4 a. m. of the 13th, and from 8.30 to 10.10 p. m.; 14th, 8.10 p. m. Port Huron, 12th, 11.30 p. m. to 5.30 a. m. of 13th. Escanaba, 12th, 8 p. m. to daybreak of the 13th, and from 10.25 to 11.30 p. m.; 14th, 8.40 to 10 p. m.

Marquette, 12th, 7.35 p. m. to 5 a. m. of the 13th; 14th, 8.45 to 9.45 p. m. Chicago, 13th, 1.10 a. m. to daybreak. Grand Haven, 12th, 7.30 p. m. to 4.30 a. m. of the 13th. Fort Brady, Mich., 13th, 9 p. m.; 16th, 9 p. m. Northport, Mich., 12th, 9 p. m. to morning of 13th. Lansing, Mich., 12th, 9 p. m. Litchfield, 12th, 8.30 p. m. Duluth, 12th, 7.20 p. m. to 5.20 a. m. of the 13th. Indianapolis, 13th, 3 to 3.22 a. m. New Corydon, Ind., 12th, 7.30 p. m.; 13th, 2 to 4.45 a. m. Elmira, Ill., 12th, 8 to 9 p. m. Morrison, Ill., 12th, 9 p. m. Riley, Ill., 12th, 8 p. m. to 3.40 a. m. of the 13th. Champaign, Ill., 12th, 10.15 p. m. to 3.30 a. m. of 13th. Madison, Wis., 12th, 10.30 p. m. to 5 a. m. of 13th. Dubuque, 12th, 7.43 p. m. to 1.22 a. m. of the 13th. Burlington, Iowa, 13th, 1 to 1.35 a. m. La Crosse, 12th, 8 p. m. to 4.30 a. m. of the 13th. Milwaukee, 13th, 12.05 to 4.30 a. m. Saint Paul, 12th, 10 p. m. to 4.30 a. m. of the 13th. Clinton, Iowa, 12th, from shortly after sunset to 3 a. m. of the 13th. Cresco, Iowa, 12th, 8.15 to 10.20 p. m. Independence, Iowa, 12th, 8 p. m. to morning of the 13th. Monticello, Iowa, 12th, 8 p. m.; 14th, 11 p. m. Mission House, Wis., 12th, 8 to 9.30 p. m.; 14th, 8 to 9.30 p. m. Embarrass, Wis., 13th, 2 a. m.; 14th, 8.30 p. m. Manitowoc, Wis., 12th, 14th. Beloit, Wis., 12th, 8 p. m. to midnight. Northfield, Minn., 12th, 8 p. m. to 4 a. m. of the 13th. Saint Vincent, Minn., 11th, during the evening; 12th, 6.30 to 10 p. m.; 14th, from dusk to 10 p. m. Bismarck, 11th, 8 p. m.; 12th, 7 p. m. to 3 a. m. of the 13th; 14th, 8 p. m. Moorhead, Minn., 12th, 8 to 9.50 p. m. Fort Stevenson, Dak., 11th, 12th, 13th, 14th; Fort Meade, Dak., 12th, 1 to 2 a. m. Fort Snelling, Minn., 12th, 8 to 10 p. m. Huron, Dak., 12th, 9 p. m.; 13th, 2 to 4 a. m.; 14th, 9 p. m. to 3 a. m. of the 15th and from 8 p. m. to midnight. Yankton, 12th, 10 p. m. to 5 a. m. of 13th. Davenport, 11.55 p. m. to 2.30 a. m. of 13th. Fort Bennett, Dak., 12th, 10 p. m. to midnight; 14th, 9.30 to 10.10 p. m. Fort Sully, Dak., 13th, 9 p. m. to morning of 14th. North Platte, 12th, 11 p. m. to 1 a. m. of the 13th; 14th, 8 to 11.30 p. m. Clay Center, Kans., 14th, 10 p. m., a bow of light, due north, of a pinkish cast and the form of a rainbow; no beams were seen. Fort Keogh, Mont., 12th, 10.15 p. m. Fort Benton, Mont., 12th, 10 p. m. Fort Shaw, Mont., 12th, 10.30 p. m. Colfax, Wash., 14th, 8.30 to 10 p. m. Spangle, Wash., 14th. Fort Lapwai, Idaho, 14th, 7.55 to 9.10 p. m. Mission, Idaho, 14th, 8.15 p. m. Dayton, Wash., 14th, 7.30 to 9.30 p. m. Umatilla, Oreg., 14th, 8 to 9.10 p. m. The following stations reported the display as materially affecting telegraphic communication: Fort Shaw, Mont., 12th. La Crosse, 13th, great difficulty was experienced in working the telegraph lines; several operators were of the opinion that the instruments could have been worked without the assistance of battery. Buffalo, 13th, telegraphic communication much disturbed. Cleveland, 12th, wires strongly affected. Albany, 12th, telegraph companies were unable to use any of the quadruplexes and with difficulty the ordinary relay; interruption to business very serious between east and west, and continued until 10.30 a. m. of the 13th. New Haven, 13th, telegraphic communication seriously interrupted. Boston, 12th, telegraph wires rendered useless during the display. The display of the 23d ranks next in importance to that of the 12th to 14th. Its appearance was not by any means as general, but its observance in an extreme southerly latitude makes it exceptional. Ithaca, N. Y., 10 to 11.30 p. m. Rochester, 10 p. m. Woodstock, Md., 9 to 10.15 p. m. Westerville, Ohio, 8 p. m. Augusta, Ga., 7 p. m., faint rose color, lasted twenty minutes; no arch. Riley, Ill., 8.30 to 11 p. m. Springfield, Ill., 8.20 p. m. Keokuk, 8.20 to 8.52 p. m. Dubuque, 8.20 p. m. Next in point of magnitude to that of the 23d, was the display of the 20th, the following stations reporting: Sydney, N. S.; Halifax, from 8 to 9 p. m.; Eastport, 9.30 p. m.; Gardiner, Me., 11 p. m.; Cornish, Me., 9 p. m.; Burlington, Vt., 11 to 11.55 p. m.; Boston, 11 to 11.45 p. m.; Alpena, 10 to 11.30 p. m. The display of the 28th was quite generally observed in New England and the Upper Lake region, the following stations reporting: Gardiner, Me., 11.30 p. m.; Mount Washington, 10 to 11.45 p. m.; Burlington, Vt., 11 to 11.15 p. m.; Alpena, 8.25 p. m. to 1.45 a. m. of the 29th. Escanaba, 10 to 11.45 p. m. Marquette, 10 to 11.45 p. m. The following were local displays of more or less brilliancy: Eastport, 29th, 8 p. m. to midnight; 16th, 9.30 p. m. Burlington, Vt., 16th, 7 to 11.30 p. m.; 25th, 11 p. m. to 1.30 a. m. of 26th. Boston, 30th, 11 p. m. Ithaca, N. Y., 30th, 9.30 p. m. Morgantown, 15th, 1 a. m. Bellefontaine, Ohio, 10th, 7.25 p. m. to 4 a. m. of the 11th. Alpena, 15th, 8.35 p. m. to 2 a. m. of the 26th. Fort Brady, Mich., 25th, 9 p. m. Northport, Mich., 25th, 10.20 p. m. until midnight. Saint Vincent, Minn., 21st, from dusk to 9.40 p. m.; 24th, 9 p. m. Yankton, 15th, 8.30 p. m. to 9 p. m. Clear Creek, Nebr., 17th and 18th.

OPTICAL PHENOMENA.

Mirage.—Swanwick, Ill., 12th, visible nearly one hour. Northport, Mich., 1st, showing Torch Lake and its surroundings, situated in Antrim County, fourteen miles to the eastward; the shore of Lake Michigan, two miles to the west and Beaver Islands and the highlands of Emmit County were distinctly visible. Umatilla, Oreg., 11th, the river, at a point about half a mile below station, appeared elevated about 10 feet, apparently forming a water-fall. Indianola, 2d, 15th, 16th, 19th and 23d. Manasquan, N. J., 6th, 1.50 p. m., ships were seen distinctly reflected upon the clouds along the New Jersey coast.

Lunar halos have been observed in the various districts on the following dates: New England, 7th; Middle Atlantic States, 2d to 5th, 8th, 9th; South Atlantic States, 4th, 8th to 14th; Florida Peninsula, 1st, 4th, 5th, 8th, 11th; Eastern Gulf States 10th, 13th; Western Gulf States, 2d to 7th, 10th; Rio Grande Valley, 7th; Ohio Valley and Tennessee, 1st, 2d, 3d, 5th, 7th, 9th, 10th, 12th, 13th, 14th; Lower Lake region, 6th, 8th, 15th; Upper Lake region, 5th, 6th, 10th, 13th, 14th, 29th; Upper Mississippi Valley, 2d, 5th, 7th, 8th, 29th; Missouri Valley, 1st, 30th; Northern Slope, 2d, 3d, 10th; Middle Slope, 30th; Northern Plateau, 7th; Southern Plateau, 28th.

Solar halos have been observed in the various districts on the following dates: New England, 19th; South Atlantic States, 9th, 19th; Ohio Valley and Tennessee, 2d, 3d, 7th, 8th, 13th, 14th, 21st, 22d; Lower Lake region, 1st, 4th, 6th, 14th, 22d, 29th, 30th; Upper Lake region, 21st, 29th; extreme Northwest, 21st, 22d; Upper Mississippi Valley, 1st, 2d, 8th, 13th, 14th, 21st, 22d, 29th; Missouri Valley, 16th; Middle Slope, 1st, 12th, 13th, 16th; Northern Slope, 17th; Northern Plateau, 3d, 7th, 21st, 26th; Middle Plateau, 17th, 27th; North Pacific region, 1st, 3d, 7th, 16th, 28th; Middle Pacific region, 27th, 28th.

MISCELLANEOUS PHENOMENA.

Prairie and forest fires.—California: San Francisco, 14th, 3 p. m., considerable smoke was observed in the northwest, and at 5.30 p. m. the greater part of the sky was obscured, followed by occasional showers of ashes; at sunset the sky had a livid appearance which caused much alarm until telegraphic reports gave information of heavy [illegible] fires in Marin County. San Diego, 8th, 9th, 10th, 11th, and 12th, brush fires in mountains. *Canada:* Great fires raging in the vicinity of Kingston, Ottawa, Gravehurst, Odessa, and Bellville, Ontario, on the 3d. At Kingston smoke very dense and business on the river almost at a standstill, boats being afraid to move. Gravehurst, several farm-houses and large barns with their contents burned. North of Bracebridge fires exceedingly destructive; several persons burned to death. Heavy brush fires between Ernstown and Collins Bay, on the line of the Grand Trunk Railroad; a large quantity of hay and stacks burned, also a number of barns and dwellings. The whole section is dark with smoke, the sun being shut out from view by a density of this element never before experienced; loss in this vicinity estimated at $80,000. Modoc township, large amount of property destroyed, including dwellings, barns, crops, implements, fences, &c. The villages of Roslin and Sterling were burned up to on every side. Gravehurst, Ontario, 16th, the Woodstock Lumber Company's mills and 3,000,000 feet of lumber burned; west end of the town on fire, one church and six houses destroyed. Buffalo, 16th, thirty-five miles south of city fires very extensive, destroying dwellings and barns; telegraphic communication interrupted; burning trees across the track seriously impeded travel. *Dakota:* Yankton, 19th and 20th. *Indian Territory:* Fort Gibson, 7th, 14th, 20th, 22d, 23d, 24th. *Texas:* Grierson Springs, 2d to 5th; Brackettville, 5th. *Kansas:* Council Grove, 17th, extensive fires west of station, 700 tons of hay burned. *Michigan:* Port Huron, 6th, extensive fires along the lake shore and in the interior of Huron and Sanilac Counties; entire county from Forestville to Port Austin in flames and the inhabitants fleeing for their lives. The small town of Port Hope entirely destroyed and many people burned to death; throughout this section the loss of farm and town property is immense. It is reported that the forests, covering miles in width, were one vast sheet of flame which traveled rapidly southward, destroying everything in its path; fires more disastrous than the great conflagration of 1871; 7th, the towns of Vassar and Minden have suffered severely but more particularly the surrounding country. Sanilac County, 10th, 215 families have been burned out in the towns of Marlette, Flynn, Argyle, Evergreen, Moore, Lalotte, and Elmer, and 92 persons burned to death. In general, the forest fires of Michigan swept over that portion of the State lying between Saginaw Bay to the north and Lake Saint Clair on the south, stretching along the coast of Lake Huron for about 100 miles, and extending inland over a breadth of from 20 to 60 miles. From 500 to 1,000 persons were burned to death, and over twenty villages and hamlets, containing a population of from 100 to 400 each, were completely destroyed; destruction of property three or four times greater than during the great fires of 1871. A vast cloud of smoke covered Lake Huron at its widest point (80 to 100 miles) with so dense a haze that navigation became extremely difficult and dangerous. Tens of thousands of dead birds were found floating upon the lake, besides which the waters were flecked with innumerable forest insects of all kinds. Neither the insects nor the birds appeared to be slain by the fire. In all probability they were driven by the heated atmosphere, flames, and sparks to seek clear air over the lake, but finding none, were lost in the smoky haze, probably injured by the foul air, and finally dropped, tired out, into the water and drowned. Wild and domestic animals were destroyed in great numbers. In regard to an estimate of the losses incurred throughout the burnt district, the following approximate calculation is given by counties: Ottawa County, $829,428; Allegan County, $116,500; Manistee County, $706,600; Huron County, $553,818; Sanilac County, $140,067; total, $2,346,412. The following is a list of property destroyed, not including the thousands of acres of forest, many miles of fencing, and immense quantity of farming implements: dwellings, 1,147; school-houses, 28; churches, 8; hotels, 12; stores and offices, 130; mills, 34; docks, 20. *New Jersey:* Trenton, 2d, the Blue Mountains were blazing for miles; dense smoke obscured the sun for several days; heat intense. *New York:* Batavia, 3d, large wooded swamp on fire and spreading for miles; two houses and several barns burned. McKean and Allegany Counties, 3d, thousands of acres burned over, with almost an incalculable loss of property; hundreds of men watched day and night for fresh outbreaks and attempted to prevent the fires spreading. About forty oil rigs and 10,000 barrels of oil were destroyed. Albany, 3d, the air is so dense with smoke in some localities that it is difficult to breathe, and it hangs like a pall over city and country for hundreds of miles. In the southwestern portion of the State miles and miles of forests and fields are on fire, with very heavy loss. Sullivan County, 3d, on the Mendall and Eldred Railroad, woods burning for miles, inflicting great loss upon the petroleum operations in that vicinity. Rixford, 3d, miles of forest in one great sheet of flame, sweeping everything in its course; roar could be heard for several miles; great loss at the oil wells; 21 tanks and 140,000 barrels of crude oil destroyed. Rome, 3d, fires still continue along the Watertown and Ogdensburgh Railroad and the Midland Railroad; railroad ties, fences, telegraph poles, and bridges have been destroyed. Saint Johnsville, 3d, fires raging over thousands of acres to the north of station, and the smoke is so dense that it is impossible to distinguish objects at a distance of 200 yards. Utica, 3d, smoke so dense that all business was for a time interrupted; objects could not be distinguished a distance of 40 rods; railroad engines moved slowly along the tracks and all communication was seriously interrupted. Sanquoit, 3d, woods burning on all sides; great destruction to timber and farming property. New York Mills, 3d, heavy forest and brush fires to the south; air for miles about filled with dense smoke, interrupting business. New Hartford, 3d, forest fires south of station; great destruction of fencing and timber. Paris Hill, 3d, hundreds of acres of forest burned; fires still raging. Fort Ann, 3d, near the northwest part of the town, on what is known as Buck Mountain, air so charged with smoke that every house in the town seemed full of it. Oswego Falls, 20th, hundreds of acres of swamp burning, filling the air with dense smoke for miles around. Pulaski, 19th, one house destroyed; underbrush and stubble-fields burning. Parish, 19th, the "big woods" on fire; several farm buildings destroyed. Carthage, 19th, terrible destruction of farm property; many families lost everything; the country for miles is swept of all buildings and every species of vegetation; men, women, and children suffering severely from smoke and loss of sleep, having fought fire night and day for the past two weeks. Carterville, 19th, fires raging terribly; all people in surrounding country have goods packed ready for flight. Daysville, 19th, great destruction of timber. Howardville, 19th, woods for miles about on fire; several barns and shanties burned. Orwell, 21st, fifteen fires visible at one time; immense destruction of timber. Kasoag, 17th, fires raged incessantly for the past fifteen days; railroad company lost 2,500 cords of wood; smoke so dense that railroad traffic has been suspended; several miles of track badly damaged; ties burned from under the rails and the latter warped by the extreme heat. Constantia, 17th, town gradually burning up; extreme loss of farm and household property. Cleveland, 17th, fires raging to the north and west with extreme violence; forests, cord-wood, barns, fences, and houses destroyed in the path of the fire; miles and miles of country converted into a blackened waste. Mexico, 17th, hundreds of acres of forest burned over; loss on farm buildings about $5,000. Hannibal, 17th, numerous fires about the town; several buildings destroyed. *Pennsylvania:* Clarendon, 3d, raging with great vehemence; the whole oil country in danger; railroad companies have wreckers on duty day and night fighting the fire. Franklin, Erie County, 3d, a strip of country five miles long and one mile wide burned over, destroying hundreds of hay and wheat stacks, several houses, and many outbuildings; loss on buildings over $30,000, while that on crops and timber cannot be estimated. *Utah:* Salt Lake City, 3d, 4th, in mountains. *Montana:* Superior City, 14th, 15th.

Foggy or smoky atmosphere.—This condition of the atmosphere became quite general from the 1st to the 10th over that portion of the United States included between the meridians of 67° and 87° W. and the 40th and 45th parallels. It reached an unusual culmination in density on the 6th in the eastern portion of the Middle Atlantic States and throughout New England, where it interrupted the prosecution of business to such a degree as to compel the necessity of artificial light in the factories, stores, and other similar places. It will be seen upon referring to the paragraph headed "Prairie and

Forest Fires," that their destructive violence throughout northern Michigan and portions of Canada has perhaps never been exceeded and that the intensity of the accompanying smoke was simply dreadful. On this day southwesterly winds prevailed from Tennessee northward to Lake Superior and thence eastward to the Canadian maritime provinces, and smoke was reported as far south as Knoxville, westward to Milwaukee, northward to Rockliffe, Canada, and eastward to New Brunswick. To show the progress eastward of this element in the atmosphere it is necessary to trace the movement of low-pressure areas over Canada and northern New England, and watch the accompanying change in wind directions. With the prevalence on the 1st of a low-pressure area (0.20 to 0.50 inch below the normal) over the Middle Atlantic States and New England, accompanied by south to southwest winds, smoke was reported from nearly every station between Detroit and Eastport, and as far north as Rockliffe. By afternoon of the 2d the low area had passed off the Nova Scotia coast, followed over New England by winds shifting to north and northeast and a complete clearing away of the smoke. During the 3d smoke was only reported from Western Canada and the Lower Lake region. By afternoon of the 4th, through the influence of an approaching area of low pressure over Canada, the winds again shifted to southerly in the Middle Atlantic States and eastern New England, followed by the reappearance of smoke as far north as Rockliffe-and eastward to Mount Washington. As the area continued its eastward movement over northern Canada the winds shifted to the west, driving the smoke eastward, so that by the morning of the 6th the latter covered the whole of New England except Maine. During the morning of the 7th it reached New Brunswick, extending thence southwestward to Lake Michigan. By morning of the 8th the low pressure previously referred to passed off the Nova Scotia coast, followed over New England by winds shifting to north and northwest and a disappearance of the smoke, stations generally reporting clear or partly cloudy weather. The following collection of data, referred to States, shows to some extent the intensity and peculiar effects of the phenomenon: *Canada:* Montreal, 6th, 7th, very dense smoke. *Connecticut:* Norwich, 6th, gas in many places of business lighted at midday. In some of the Cape towns cattle ceased feeding and hens went to roost. Putnam, 6th, lamps lighted at midday, schools closed, and business generally suspended except where gas or lamps were used. Woodstock, 6th, during most of the day business carried on by the aid of gas or lamps; schools closed. Hartford, 6th, business generally suspended; houses lighted by gas or lamps during the day; atmosphere of a yellowish cast. *Massachusetts:* Boston, 6th, a remarkably yellow condition of the atmosphere began to form about 5 a. m., composed partly of fog, but mostly of smoke, occupying the elevated regions of the atmosphere; no unusual smell accompanied the phenomenon. The air was loaded with dampness, and the breeze was so gentle that for several hours the smoke arising from the city and factories hung about the lower strata of air, passing very slowly seaward and occasionally rising to a sufficient altitude to intensify the peculiar darkness. At times the glare of this peculiar condition of the sky was very painful to the eyes, and in the open air all brilliant colors, and particularly those in direct contrast with yellow, appeared under very strange hues. Grass turned dark and dull, and delicately colored flowers faded until their colors became blended. Stars were visible in the zenith at 8 a. m. Dukes Island, Nantucket, and Cape Cod, 6th, reported darkness during most of the day as very marked, seriously affecting business, except where lamps were made use of. Springfield, 6th, day opened with a dense fog suspended at a considerable elevation; there appeared to be present with the fog a peculiar substance, giving to the whole mass a strange yellow color. The color of surrounding objects was remarkably affected. Spectrum analysis revealed the fact that the blue end of the spectrum as far as and including the violet was almost entirely absent. The phenomenon had a strange effect upon gas-lights, giving them the appearance of small electric lights, while the latter had a blue color. It was perfectly calm most of the day and the humidity was very high. Fall River, 6th, 9 a. m., stores and residences lighted; in all the mills and factories lights were burned; public schools were closed. North Adams, 6th, mills and stores were lighted during the forenoon; about 11 a. m. air grew clearer, and by noon the sun shone like a brilliant pink ball; for a time the heat was very oppressive. In some of the neighboring towns the female mill operatives became so frightened by the peculiar appearance that they stopped work and fled to their homes; streets were crowded with excited people, who believed that the "day of judgment" was at hand. Salem, 6th, no such atmospheric peculiarity since the famous dark day of May 19, 1780; all stores on Essex street brilliantly lighted at noon, also the great mills of the Naumkeag Steam Cotton Company. Lynn, 6th, many factories closed early in the afternoon; business quite generally suspended. *Michigan:* Port Huron, 1st; heavy fog at daybreak; during the day lower atmosphere filled with dense smoke, which continued on the following dates: 2d, 3d, 6th to 8th, 10th, 21st. *New Hampshire:* Nashua, 6th, in the morning artificial light was necessary for all kinds of outdoor business; gas-light had the appearance of an electric light, and grass and foliage were of a bright green hue. Hanover, 6th, in the morning the sky overhead was of a light olive, shading off all around to a decided green at the horizon. The light was of a pronounced yellowish green, intensifying the green color of the grass, trees, &c., while houses painted white showed more distinctly a yellowish hue. Contoocookville, 6th, lamps were lighted at midday; schools were closed and business generally suspended. *New York:* Albany, 6th, 5 a. m., a few stratus clouds in the lower atmosphere, together with what appeared to be light smoke, the latter gradually increased in density until 7.30 a. m. when the entire heavens were hidden and from 8 to 9.40 a. m. it was so dark that artificial light was necessary to enable business to be transacted. The color of the atmosphere was yellow or light brown as the density of the smoke appeared to increase or decrease and a remarkable effect was produced on all objects upon the earth's surface. Grass and all objects of green color were made to appear unusually bright, while blue was changed to purple or pink. The smoke did not extend immediately to the earth's surface, but hung as a cloud of low elevation. No smell of smoke was detected at any time; the sky became clear at 11.30 a. m. *Tennessee:* Knoxville, 7th, peculiar haze through which the reflected light of the sun gave strange effect to various objects. *New Jersey:* Freehold, 8th, very smoky all day; sun could be seen with naked eye without pain; at night moon very red. *North Carolina:* Weldon, 7th, sun in early morning obscured by a peculiar haze in the atmosphere, through which the light shone with a perfect pink color, a condition which it maintained all day. The light when passing through a door or window cast a purple-colored shadow on the floor; 8th, similar conditions prevailed; smoke more dense; by 2 p. m. sun entirely obscured. *Rhode Island:* Providence, R. I., 6th, supply of gas gave out early in the afternoon and the whole city was left in almost complete darkness. Block Island, 6th, day very dark, atmosphere of a yellowish hue. Point Judith, 6th, densely foggy until 10 a. m., when the atmosphere assumed a yellowish tinge and was perfectly calm; surrounding objects appeared as if viewed through colored glass and artificial light became necessary in order to perform work in-doors. Phenomenon continued until 4 p. m., after which it gradually dissipated. Newport, 6th, very dense fog in the morning, which, at about 10 a. m., changed to a yellowish color and lifted a short distance above the earth's surface. This peculiar cloud increased in density and the color become a deeper yellow; sometimes it was tinged with a pale green or light brown. Grass and trees were of a deeper green color and sunflowers appeared to be white. From 1.30 to 4.30 p. m., artificial light was necessary to the performance of business; at 5 p. m., it gradually grew lighter; 8 p. m., moon came out very red, but in the course of an hour assumed its natural appearance; air calm most of the day. *Vermont:* Bellows Falls, 6th, so dark that at the hotels and private residences breakfast and dinner were partaken of by lamp-light; offices and stores were lighted and lamps were used in railroad trains. The sun shone quite bright in the afternoon.

Sunsets.—The characteristics of the sky at sunset as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from 181 stations show 5,398 observations to have been made, of which 22 were reported doubtful; of the remainder, 5,376, or 84.6 per cent., were followed by the expected weather.

Sun spots.—The following record of observations, made by Mr. D. P. Todd, assistant, has been forwarded by Prof. S. Newcomb, United States Navy, Superintendent, Nautical Almanac Office, Washington, D. C.:

DATE—Sept. 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.
7, 10 a. m.	....	....	....	....	....	....	4	25†
8, 8 p. m.	0	0	1	5	0	0	3	20†
13, 11 a. m.	....	....	....	....	....	....	4	30†
14, 12 m.	0	0	0	0	0	0	4	30†
15, 4 p. m.	0	0	0	5	0	0	4	25†
16, 12 m.	0	0	2	5	0	0	2	20†
17, 9 a. m.	0	5	0	0	0	0	1	25†
18, 8 p. m.	2	5	0	0	1	3	3	25†
19, 11 a. m.	0	0	1	5	0	0	2	20†
20, 9 a. m.	0	0	0	0	0	0	2	15†
21, 12 m.	0	0	0	0	0	0	2	12
24, 12 m.	0	0	....	....	0	0	2	5
25, 1 p. m.	1	1	1	3	1	1	2	3
27, 11 a. m.	2	4	0	0	0	0	4	7
28, 2 p. m.	1	2	0	0	0	0	5	9
30, 3 p. m.	0	0	0	0	0	0	5	9

†Approximated. Faculæ were seen at the time of every observation.

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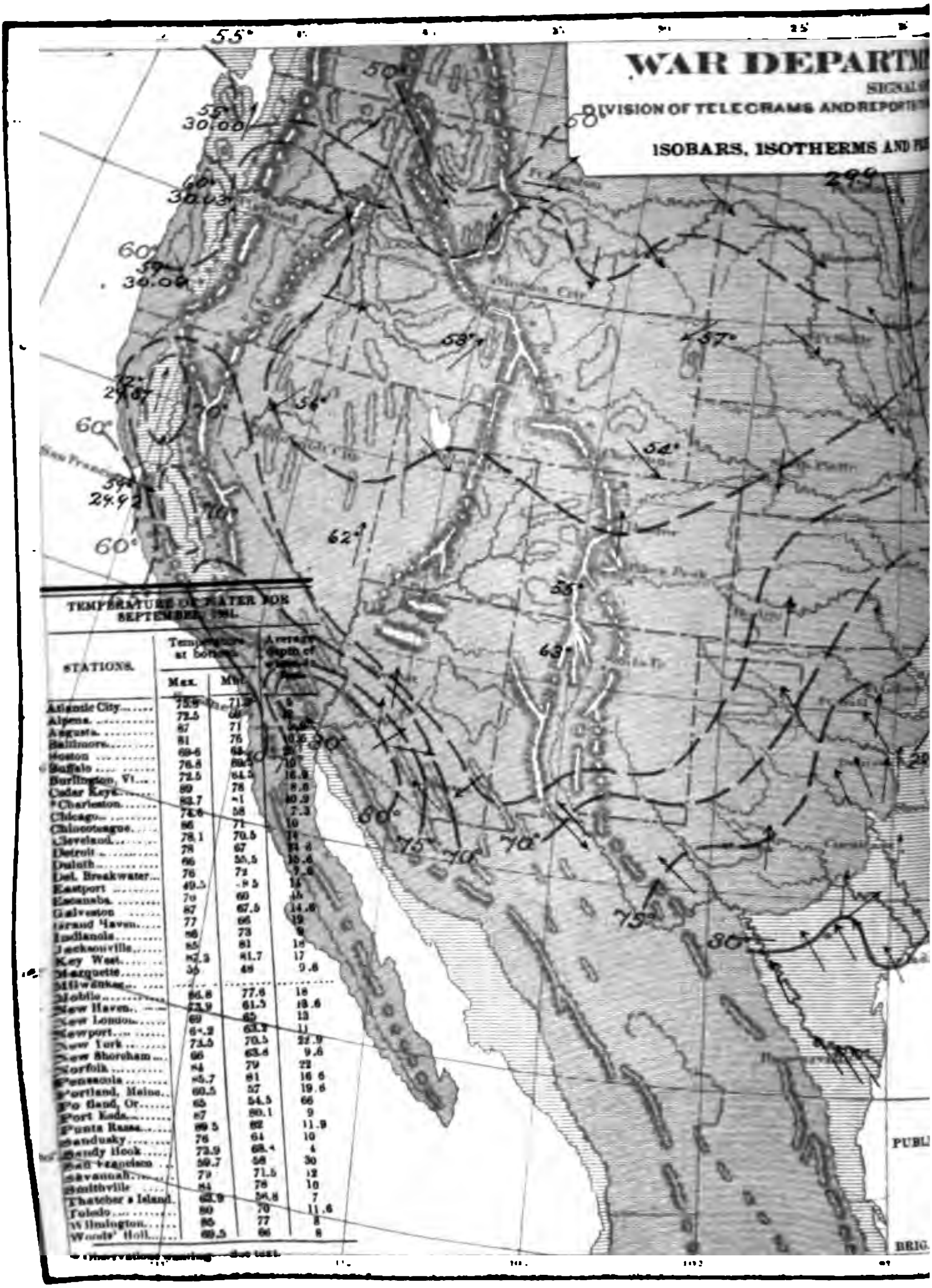
WAR DEPARTM

SIGNAL

DIVISION OF TELEGRAMS AND REPORTS

ISOBARS, ISOTHERMS AND

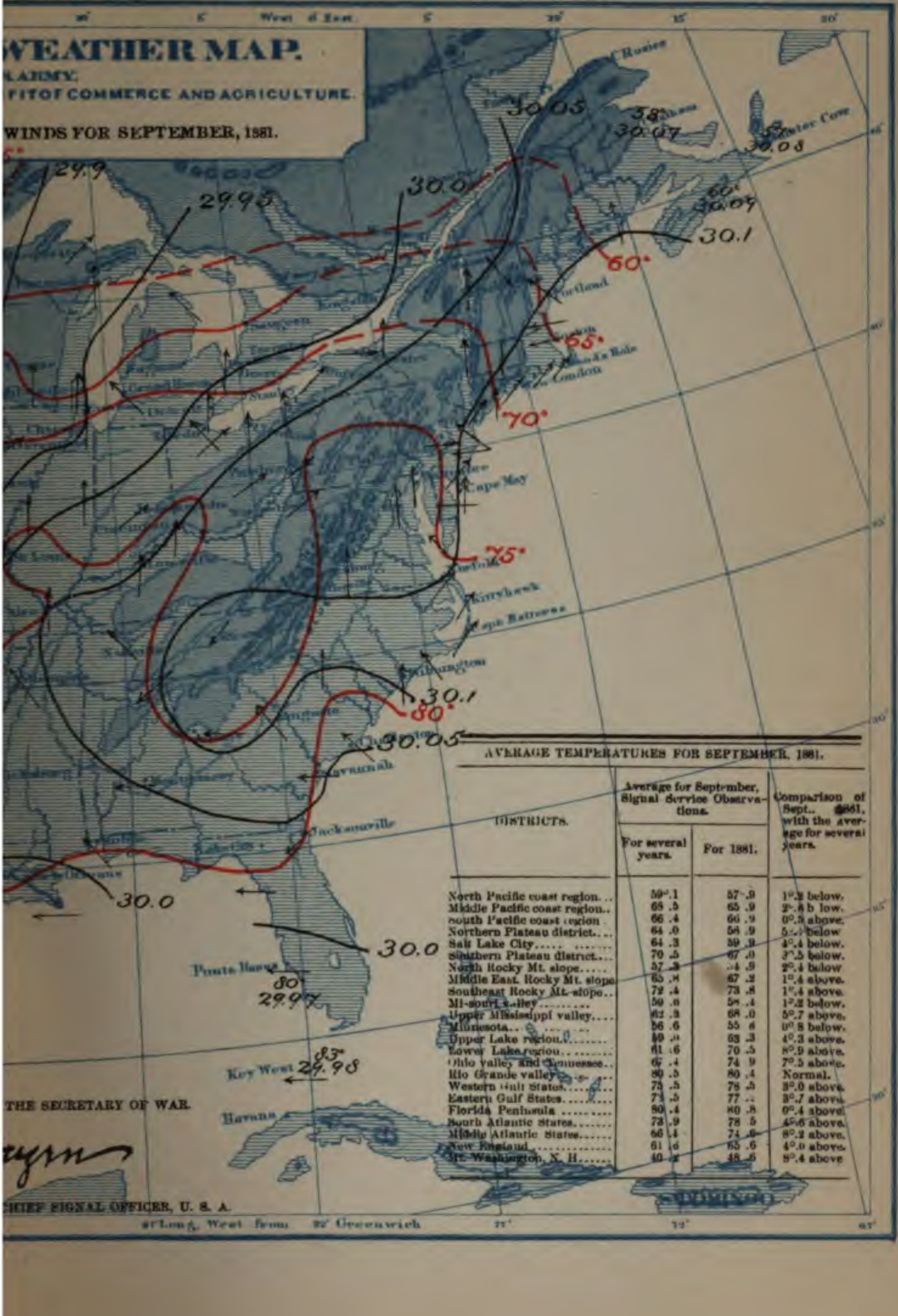


TEMPERATURE OF WATER FOR SEPTEMBER, 1881.

STATIONS.	Temperature at bottom.		Average depth of water in feet.
	Max.	Min.	
Atlantic City	75.9	71.9	5
Alpena	72.5	66	16
Augusta	67	71	14.6
Baltimore	81	76	10.6
Boston	69.6	64	[illegible]
Buffalo	76.8	69.5	10
Burlington, Vt.	72.5	64.5	16.8
Cedar Keys	89	78	8.8
*Charleston	83.7	81	10.9
Chicago	74.6	58	7.3
Chincoteague	86	71	10
Cleveland	78.1	70.5	14
Detroit	78	67	14.6
Duluth	66	55.5	15.6
Del. Breakwater	76	72	7.6
Eastport	49.5	48.5	15
Escanaba	70	60	15
Galveston	87	67.5	14.6
Grand Haven	77	66	19
Indianola	86	73	9
Jacksonville	85	81	16
Key West	87.3	81.7	17
Marquette	55	48	9.6
Milwaukee			
Mobile	86.8	77.6	18
New Haven	73.9	61.5	18.6
New London	69	63	13
Newport	64.2	63.7	11
New York	73.5	70.5	22.9
New Shoreham	66	63.4	9.6
Norfolk	84	79	22
Pensacola	85.7	81	16.6
Portland, Maine	60.5	57	19.6
Portland, Or.	65	54.5	66
Port Eads	87	80.1	9
Punta Rassa	89.5	82	11.9
Sandusky	76	64	10
Sandy Hook	73.9	68.4	4
San Francisco	59.7	58	30
Savannah	79	71.5	12
Smithville	84	78	10
Thatcher's Island	63.9	56.8	7
Toledo	80	70	11.6
Wilmington	85	77	8
Woods' Holl	69.5	66	8

* Observations wanting — [illegible]

No. II.



AVERAGE TEMPERATURES FOR SEPTEMBER, 1881.

DISTRICTS.	Average for September, Signal Service Observations.		Comparison of Sept., 1881, with the average for several years.
	For several years.	For 1881.	
North Pacific coast region.	59°.1	57°.9	1°.2 below.
Middle Pacific coast region.	68 .5	65 .9	2°.6 b low.
South Pacific coast region	66 .4	66 .9	0°.5 above.
Northern Plateau district.	64 .0	58 .9	5°.1 below
Salt Lake City.	64 .3	59 .9	4°.4 below.
Southern Plateau district.	70 .5	67 .0	3°.5 below.
North Rocky Mt. slope.	57 .3	54 .9	2°.4 below
Middle East. Rocky Mt. slope	65 .8	67 .2	1°.4 above.
Southeast Rocky Mt. slope.	72 .4	73 .8	1°.4 above.
Missouri valley.	59 .6	58 .4	1°.2 below.
Upper Mississippi valley.	62 .3	68 .0	5°.7 above.
Minnesota.	56 .6	55 .8	0°.8 below.
Upper Lake region.	59 .0	63 .3	4°.3 above.
Lower Lake region.	61 .6	70 .5	8°.9 above.
Ohio valley and Tennessee.	67 .4	74 .9	7°.5 above.
Rio Grande valley.	80 .5	80 .4	Normal.
Western Gulf States.	75 .5	78 .5	3°.0 above.
Eastern Gulf States.	73 .5	77 .2	3°.7 above.
Florida Peninsula	80 .4	80 .8	0°.4 above.
South Atlantic States.	73 .9	78 .5	4°.6 above.
Middle Atlantic States.	66 .4	74 .6	8°.2 above.
New England.	61 .6	65 .6	4°.0 above.
Mt. Washington, N. H.	40 .2	48 .6	8°.4 above

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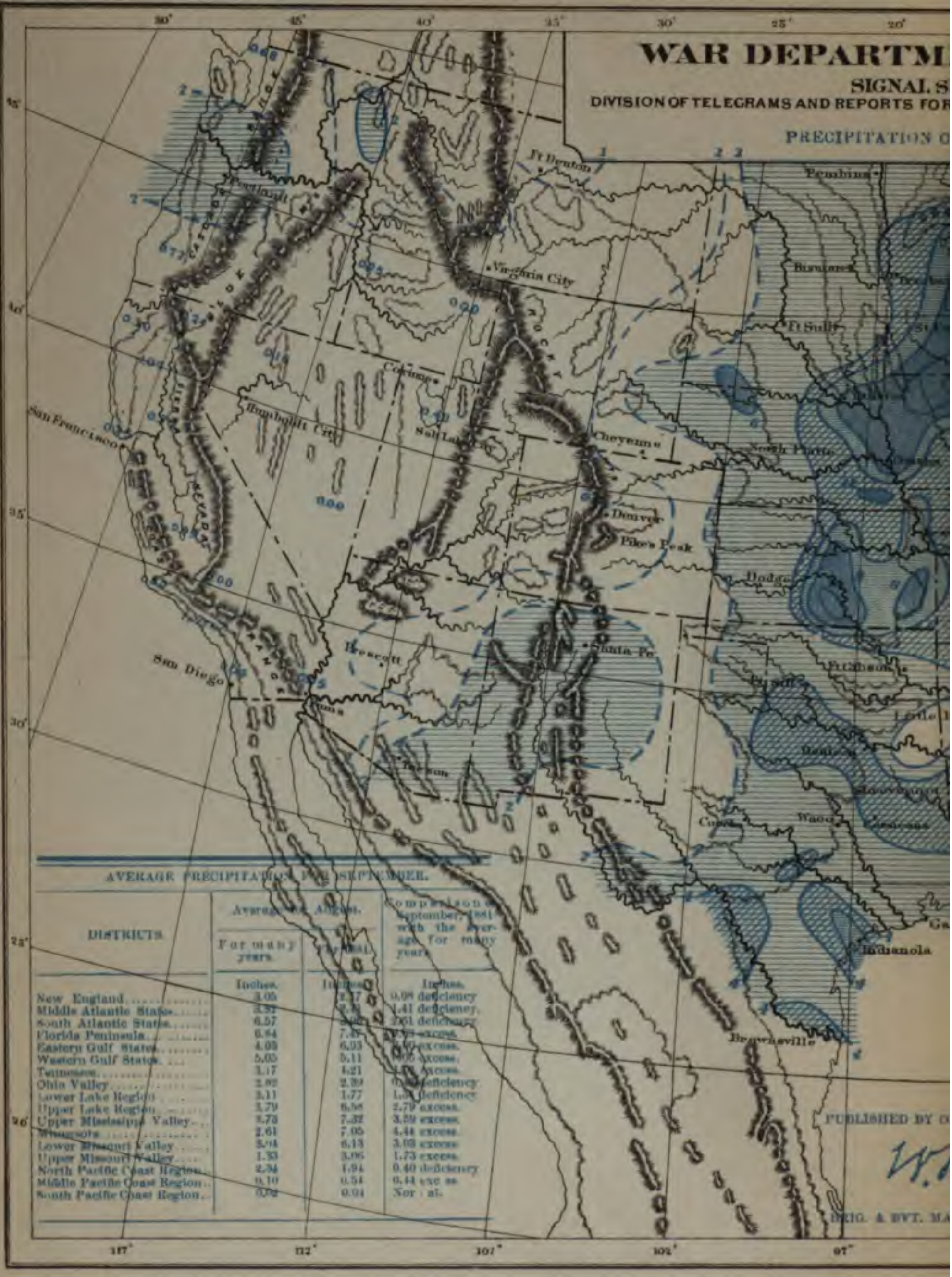
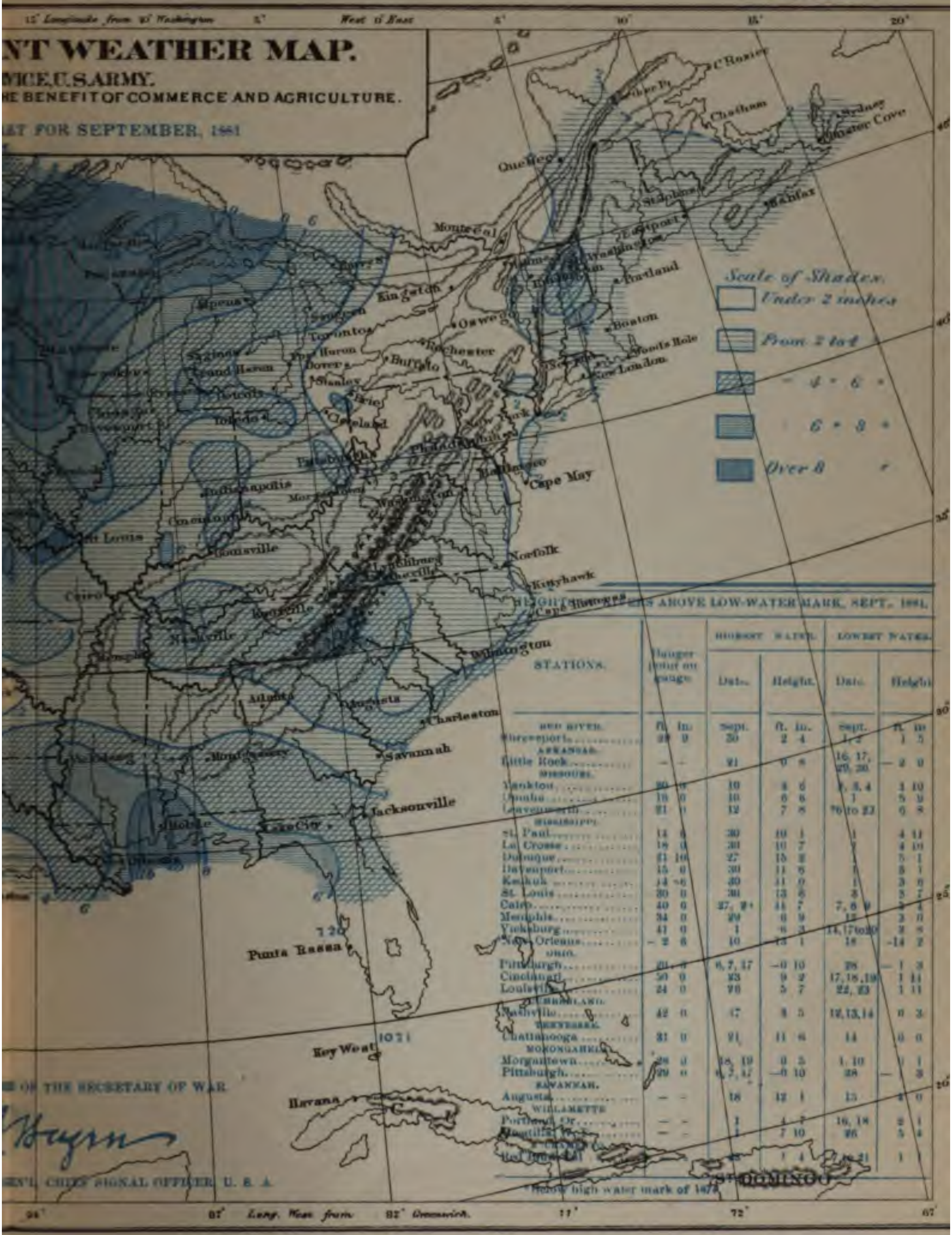


AVERAGE PRECIPITATION FOR SEPTEMBER.

DISTRICTS	Average for August.		Comparison of September, 1881, with the average for many years.
	For many years.	Actual.	
	Inches.	Inches.	Inches.
New England	3.05	[illegible]	0.08 deficiency
Middle Atlantic States	[illegible]	[illegible]	1.41 deficiency
South Atlantic States	6.57	[illegible]	[illegible] deficiency
Florida Peninsula	6.84	[illegible]	[illegible] excess
Eastern Gulf States	4.03	6.03	[illegible] excess
Western Gulf States	5.05	5.11	[illegible] excess
Tennessee	3.17	4.21	[illegible] excess
Ohio Valley	2.82	2.39	[illegible] deficiency
Lower Lake Region	3.11	1.77	[illegible] deficiency
Upper Lake Region	3.79	6.58	2.79 excess
Upper Mississippi Valley	3.73	7.32	3.59 excess
Minnesota	2.61	7.05	4.44 excess
Lower Missouri Valley	[illegible]	6.13	3.09 excess
Upper Missouri Valley	1.33	3.06	1.73 excess
North Pacific Coast Region	2.34	1.94	0.40 deficiency
Middle Pacific Coast Region	0.10	0.54	0.44 excess
South Pacific Coast Region	[illegible]	0.04	Normal.

No. III.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, SEPT., 1881.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER.	
			Date.	Height.		Date.	Height.
RED RIVER.	ft.	in.	Sept.	ft.	in.	Sept.	ft. in.
Shreveport	29	9	30	2	4	1, 2	1 5
ARKANSAS.							
Little Rock	—	—	21	0	8	16, 17, 29, 30	— 2 0
MISSOURI.							
Yankton	20	0	10	4	6	2, 3, 4	3 10
Omaha	18	0	10	6	6	1	5 9
Leavenworth	21	0	12	7	8	16 to 23	6 8
MISSISSIPPI.							
St. Paul	14	6	30	10	1	1	4 11
La Crosse	18	0	30	10	7	1	4 10
Dubuque	21	10	27	15	2	1	5 1
Davenport	15	0	30	11	6	1	5 1
Keokuk	14	6	30	11	0	1	3 6
St. Louis	30	0	30	13	8	3	5 7
Cairo	40	0	27, 29	11	7	7, 8, 9	3 4
Memphis	34	0	29	6	9	12	3 0
Vicksburg	41	0	1	6	3	14, 17 to 20	2 8
*New Orleans	— 2	6	10	13	1	18	—14 2
OHIO.							
Pittsburgh	21	0	6, 7, 17	—0	10	28	— 1 3
Cincinnati	50	0	23	9	2	17, 18, 19	1 11
Louisville	24	0	26	5	7	22, 23	1 11
CUMBERLAND.							
Nashville	42	0	17	8	5	12, 13, 14	0 3
TENNESSEE.							
Chattanooga	31	0	21	11	6	14	0 0
MONONGAHELA.							
Morgantown	28	0	18, 19	0	5	1, 10	1 1
Pittsburgh	29	0	6, 7, 17	—0	10	28	— 1 3
SAVANNAH.							
Augusta	—	—	18	12	1	15	4 0
WILLAMETTE							
Portland, Or.	—	—	1	4	7	16, 18	2 1
[illegible]	—	—	1	7	10	26	5 4
[illegible]							
Red Bluff, Cal.			[illegible]	1	4	7 to 21	1 1

*Below high water mark of 1874.

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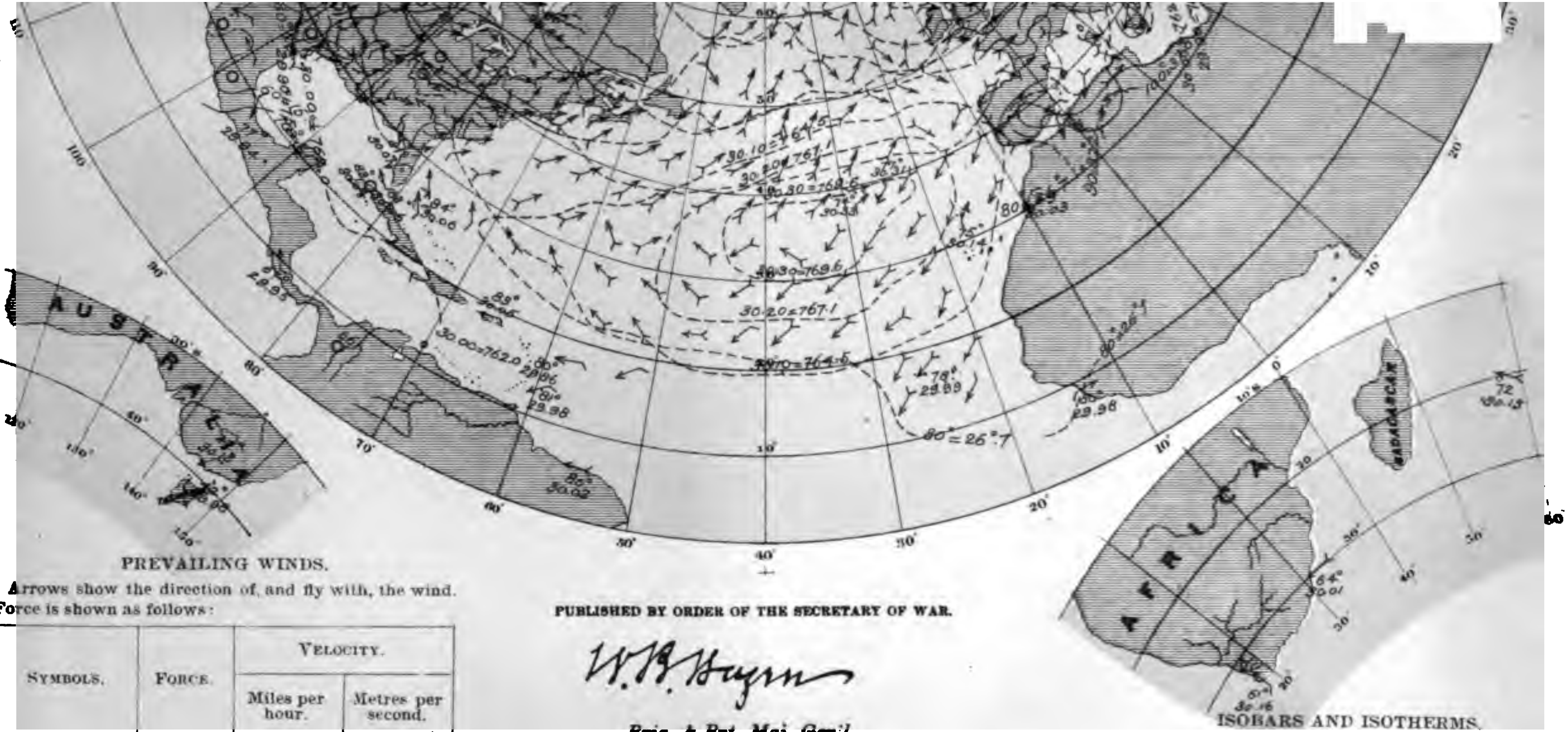


PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind.
Force is shown as follows:

Symbols.	Force.	Velocity.	
		Miles per hour.	Metres per second.
⊙	0	0	0
→	1, 2	0 to 9	0 to 4.0
→	3, 4	9.1 to 22.5	4.1 to 10.1
→	5, 6	22.6 to 40.5	10.1 to 18.1
→	7, 8	40.6 to 67.5	18.1 to 30.2
→	9, 10	67.6 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

ISOBARS AND ISOTHERMS.

Isobars in *blue*: detached barometer means in English inches.
Isotherms in *red*; detached temperature means in degrees Fahrenheit.
Broken lines, are doubtful.

INTERNATIONAL MONTHLY CHART.

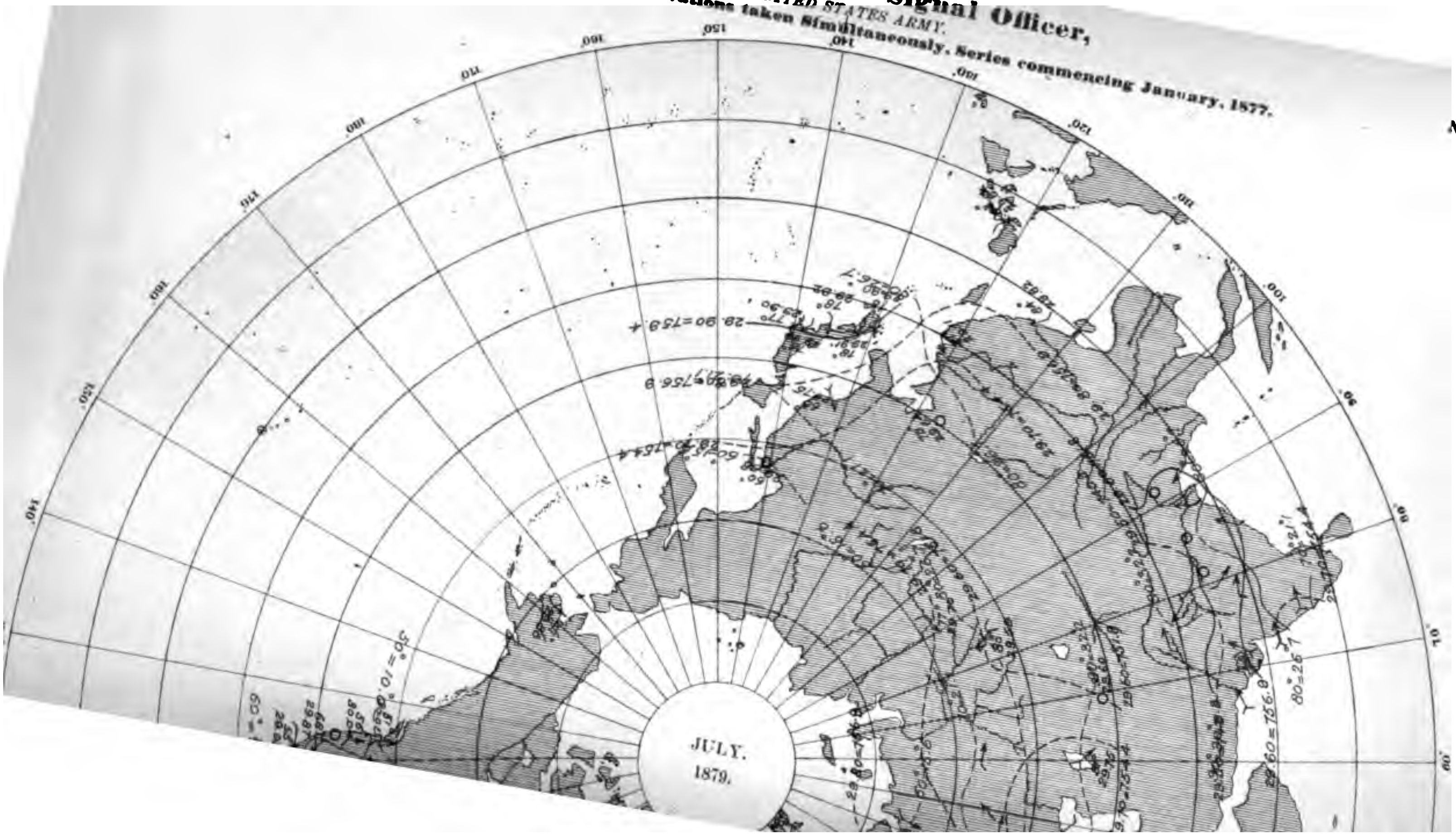
Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of July, 1879, based on the daily charts of the International Bulletin

Office of the Chief Signal Officer,

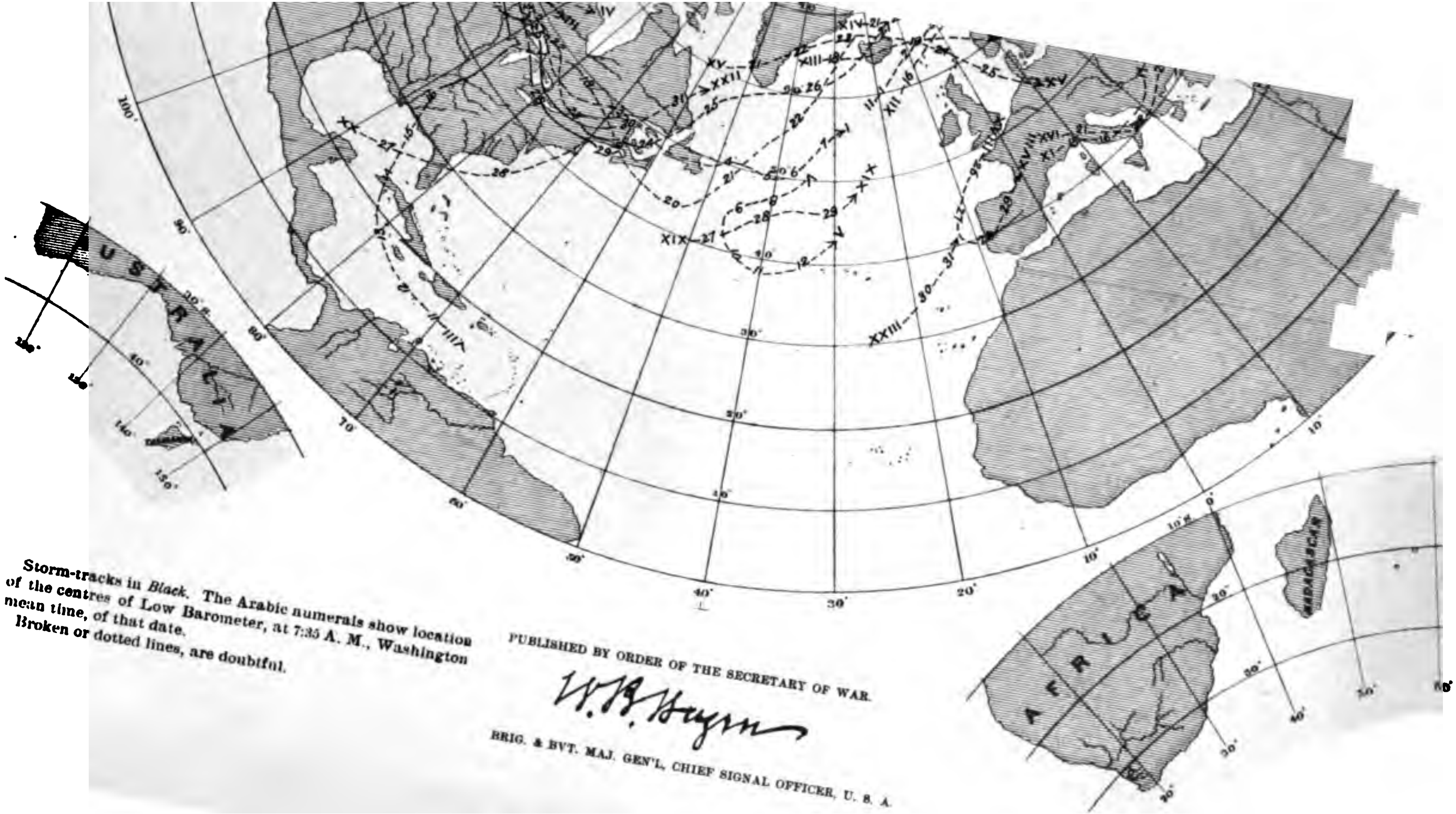
UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously. Series commencing January, 1877.

No. V.



15



Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.
Broken or dotted lines, are doubtful.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

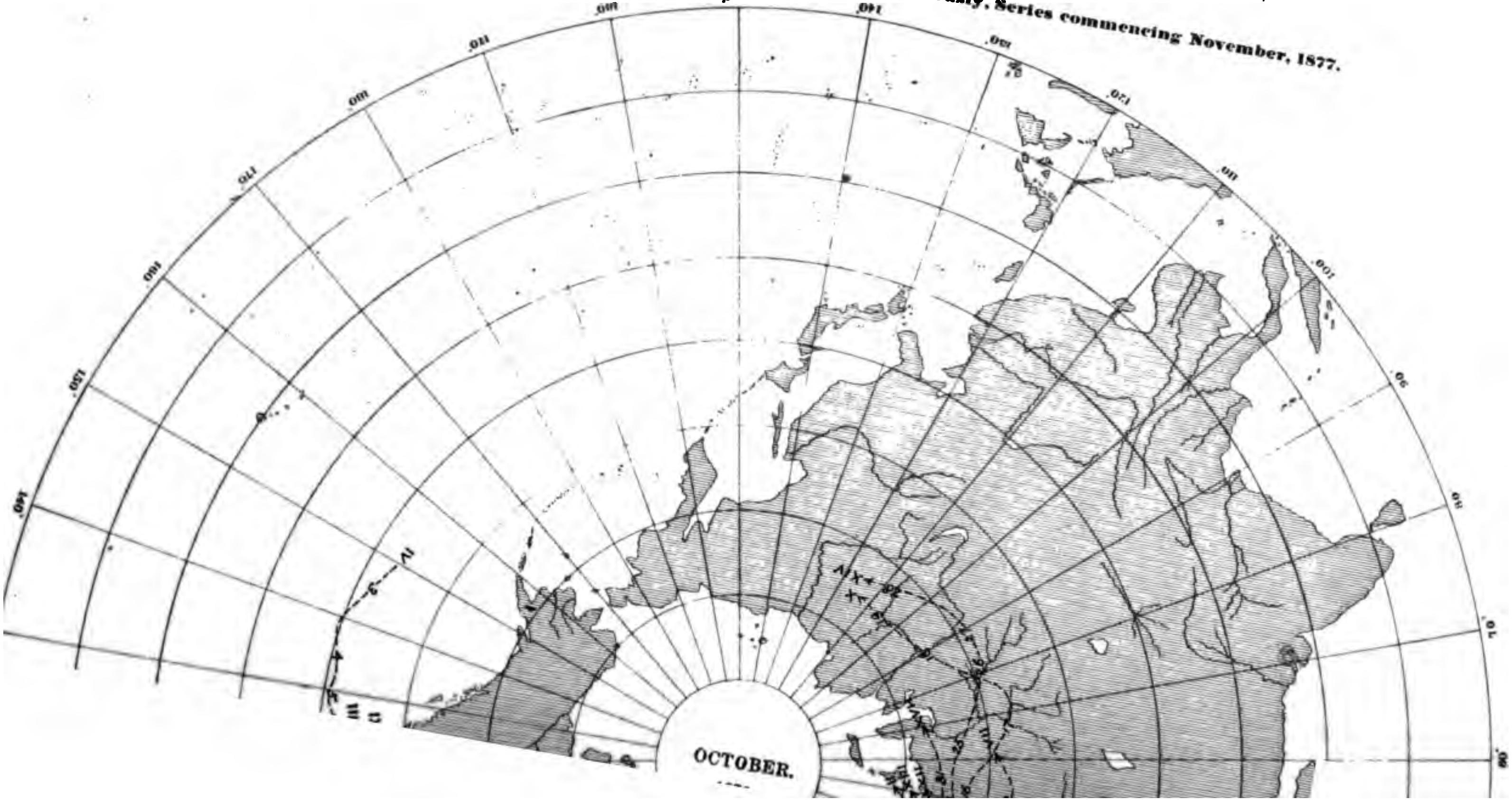
INTERNATIONAL
Showing Track

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. VI.



Mr. H. D. Gowey, at North Lewisburg, Ohio, reports: sun spots were observed on every clear day during the month: they were most numerous on the 1st and 19th; the largest were observed during last of month. Mr. David Trowbridge, at Waterburgh, N. Y., reports as follows: 1st, 3 groups, 15 spots; 3d, 2 groups, 7 spots, dense fog interfered with observation; 4th, 1 group, 4 spots, 1 group disappeared by rotation; 5th, 2 groups, 5 spots, a new group of 2 spots has disappeared; 6th, 4 groups, 5 spots, 2 new groups; 7th, 2 groups, 5 spots, 2 groups observed on 5th, disappeared; 10th, 1 group, 3 spots; 12th, 4 groups, 12 spots, 1 new group near west side, must have arisen since the 10th, 1 appeared by rotation, and the appearance of a third group is not accounted for; 13th, 4 groups, same as observed on 12th, 15 spots; 14th, 4 groups, 13 spots, 1 large spot has disappeared; 15th, 4 groups, 9 spots; 16th, 1 group, 4 spots, 2 groups have disappeared by rotation, and one gone out; 17th, 1 group, 4 spots, same as 16th; 18th, 1 group, 7 spots; 19th, 2 groups, 5 spots, 1 new group appeared by rotation, faculae near; 21st, 2 groups, 4 spots, same as observed on 19th; 22d, 2 groups, 2 spots; 23d, 2 groups, 2 spots, same as observed on 22d; 25th, 1 group, 2 spots, the west group has disappeared by rotation; 26th, 2 groups, 3 spots, 1 new group has appeared by rotation; 28th, 29th, 2 groups, 2 spots, same as observed on 26th; 30th, 3 groups, 3 spots, 1 new group has arisen near middle of disk.

Meteors.—Prescott, Ariz., 8th, remarkably brilliant; was observed falling from a point in southwestern heavens, about 30° above the horizon; it moved in a westerly direction and left in its trail a train of sparks resembling those emitted from an exploded rocket. North Platte, Nebr., 26th, 7.20 p. m., seen in northwestern sky; it left a trail of white and light-bluish color, and exploded into three distinct fragments. Davenport, Iowa, 24th, 11 p. m., very brilliant. Burlington, 24th, 9.25 p. m., having the appearance of a signal rocket; color, bluish white with dark blue near center; exploded and left a track of deep crimson. Somerville, N. J., 13th, 9 p. m., in the west, descended slowly with a curve and exploded like a rocket. Hector, N. Y., 13th, in appearance about the size of the full moon, appeared in the southern heavens, moved downward, leaving heavy trail of light and illuminated the whole heavens; flight lasted six seconds.

Polar bands.—Portland, Oreg., 3d and 7th; Mobile, 9th; New Corydon, Ind., 2d, 8th, 14th, 18th, and 21st; Clinton, La., 9th; Guttenburgh, Iowa, 17th and 18th; Yates Center, Kans., 7th, 12th, 13th, 28th, and 30th; Gardiner, Me., 17th and 28th; Thornville, Mich., 14th; Fayette, Miss., 1st, 6th, 9th; Auburn, N. H., 29th; Wytheville, Va., 19th.

Earthquakes.—Angel Island, 18th, 5.15 p. m., slight shock. San Francisco, 18th, 5.20 p. m., severe shock, vibration from west to east; duration five seconds; no damage reported other than slight breakage to crockery.

Sand-storms.—Winnemucca, 22d; Brackettville, Tex., 4th and 5th; Fort Yuma, 17th and 26th.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

APPENDIX No. 79.

MONTHLY WEATHER REVIEW, OCTOBER, 1881.

INTRODUCTION.

In preparing this Review the following data, received up to November 20th, have been used, viz, the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 186 monthly journals and 161 monthly means from the former, and 15 monthly means from the latter; 212 monthly registers from voluntary observers; 55 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of October, 1881, is shown by isobaric lines (in black) upon Chart No. II. The area of lowest pressure covering as it does the Canadian maritime provinces probably results from a translation northeastward of the area of low for September, embracing at that time the Upper Mississippi Valley. Over the interior of the country east of the Mississippi the pressure has rapidly increased during the month, and the area of highest (abnormally high) pressure covers the South Atlantic States. Compared with the past month the pressure is everywhere higher except in the Canadian maritime provinces, where the most decided fall of the month has occurred. The region of greatest increase embraces that portion of the country from the Arkansas River northward to the British Possessions.

Departures from the normal values for the month.—Compared with the means for previous years, the mean pressure for the present month is everywhere above the normal east of the 90th meridian, the increase varying from 0.04 to 0.12 inch. Throughout the Rocky Mountain slopes, in the Lower Missouri Valley, and in the central portion of the Upper Mississippi Valley, the pressure is from 1.01 to 0.06 inch below the normal, the barometer having been slow to recover from the marked deficiencies of these regions during September. In the Plateau regions, South Pacific and North Pacific Coast regions, other areas of deficiency exist ranging from 0.01 to 0.13 inch, being most marked in the Middle Plateau. Stations reporting a normal condition are Shreveport, Memphis, Saint Louis, and Keokuk.

Barometric ranges.—The range of pressure for the month has generally varied from 0.5 to 1.0 inch, and in the extremes from 0.24 inch at San Diego to 1.2 inches at Yankton and 1.26 inches on summit of Mount Washington. Throughout the several districts the monthly barometric range varied as follows: New England, from 1.13 inches at Albany, Thatcher's Island, and Burlington to 1.26 inches on summit of Mount Washington; Middle Atlantic States, 0.9 at Lynchburg to 1.13 at Sandy Hook; South Atlantic States, 0.49 at Jacksonville to 0.95 at Norfolk; Eastern Gulf States, 0.5 at Pensacola to 0.57 at Atlanta; Florida Peninsula, 0.36 at Key West to 0.46 at Cedar Keys; Western Gulf States, 0.47 at Castroville to 0.77 at Fort Gibson; Tennessee and the Ohio Valley, 0.55 at Nashville to 0.89 at Morgantown; Lower Lake region, 0.8 at Sandusky to 1.05 at Oswego; Upper Lake region, 0.86 at Port Huron to 1.17 at Duluth; Upper Mississippi Valley, 0.67 at Cairo to 1.12 at La Crosse; Missouri Valley, 0.87 at Fort Bennett to 1.20 at Yankton; extreme Northwest, 1.01 at Fort Buford to 1.19 at Moorhead; Northern Slope, 0.61 at Cheyenne to 0.91 at Fort Keogh; Middle Slope, 0.66 at Denver to 0.91 at Dodge City; Southern Slope, 0.46 at Stockton to 0.73 at Jacksborough; Rio Grande Valley, 0.49 at Eagle Pass and Laredo to 0.98 at Rio Grande; Southern Plateau, 0.31 at Tucson to 0.42 at Yuma; Middle Plateau, 0.44 at Winnemucca to 0.56 at Salt Lake City; Northern Plateau, 0.51 at Eagle Rock to 0.75 at Umatilla; North Pacific coast, 0.79 at Roseburg to 0.95 at Olympia; Middle Pacific coast, 0.51 at Sacramento to 0.61 at Red Bluff; South Pacific coast, 0.24 at San Diego to 0.48 at Visalia.

Areas of high barometer.—There has been a general excess of atmospheric pressure east of the Mississippi River and a general deficiency west of the 100th meridian. The greatest excess is noted in Minnesota, the Lake region, and New England. Associated with this distribution of pressure it is deserving of remark that contrary to the usual rule there was a general excess of temperature in the regions which had a pressure above the mean and a deficiency in temperature in the regions where the pressure was below the mean. Only five high areas have merited description, all of which occurred before the 20th of the month.

No. I.—On the 2d there was a decided rise in pressure in Manitoba and Dakota. On the 3d the barometer continued rising, the highest readings reported were: Fort Buford, 30.57 or 0.5 inch above the normal, Fort Stevenson, 30.51 or 0.45 inch above the normal. On the 4th the observed pressures remained highest in Dakota; the northern portion of that Territory being in general more than one-half inch above the normal. On the 5th the high area was rapidly transferred to the southeastward. At the end of that day the isobar of 30.4 included the country from the Upper Lake region and Upper Mississippi Valley to the Middle Atlantic and Carolina coast. On the 6th the highest area was in the Middle Atlantic States; the highest pressures reported were, Philadelphia, 30.52; Baltimore, Washington, and Lynchburg, 30.54; Norfolk and Charlotte 30.51. On the 7th and 8th the pressure remained highest in the South Atlantic and East Gulf States, while a slight depression was moving across Canada from Manitoba to the Gulf of Saint Lawrence. In connection with this high area, frosts were reported on the morning of the 5th, from the Lake region, Middle States, and New England, and on the morning of the 6th, from the Lower Lake region and Middle and Atlantic States.

No. II.—On the 8th there was a great rise in pressure in Dakota and Manitoba. On the 9th the high area continued nearly stationary in position, and the highest readings reported were as follows: Fort Buford, 30.62; Fort Garry, 30.63; Saint Vincent, 30.63. On the 10th the high area moved over the Lake region, and on the 11th was transferred to the Middle Atlantic States, where, at the morning report, the isobar of 30.6 included Albany, Baltimore, and Washington. On the 12th and 13th the highest pressure moved into the South Atlantic States during the passage of low area No. I over the Lake region.

No. III.—On the 12th, in rear of low area No. I, the barometer rose very rapidly in the extreme Northwest, the isobar of 30.6 including nearly all of Dakota and Montana. On the 13th the high area extended over the Lake region, accompanied by high winds on the North Atlantic coast. On the 14th the high area was transferred to New England, and on the 15th it disappeared before the advance of low area No. II, then moving over the Lake region.

No. IV.—On the 15th, following the passage of low area No. II, there was a sharp rise of pressure in the Northwest which, on the 16th, extended over the Lake region; on the 17th the highest barometer was transferred beyond the maritime provinces and Nova Scotia; the highest barometer reported was at Farther Point, 30.57, or 0.6 inch above the normal.

No. V.—The barometer rose quite rapidly in the Northwest on the 17th in rear of low area No. III. On the 18th the rise extended over the Upper Lake region and the Ohio Valley. On the 19th the high area was transferred to the New England coast, and then disappeared in advance of low area No. IV.

Areas of low barometer.—The tracks of the centers of six areas of low barometer have been charted for this month. One only—No. I—is traced from the Pacific coast. Three—Nos. II, III and VI—developed in the Rocky Mountain region. Two—Nos. I and II—exhibited great energy in the Lake region. One—No. III—developed great energy on the New England coast. The month is remarkable from the fact that no storm center passed along the Gulf coast or the Atlantic coast south of New York, which probably accounts for the deficiency in rainfall noted in the Middle Atlantic, South Atlantic, and East Gulf States.

No, I.—On the 10th a depression, unaccompanied by rain, crossed California in an easterly track, and, moving with great rapidity, was, at the 11 p. m. report of the 11th, central in the Upper Mississippi Valley. On the 12th the low area crossed the Upper Lake region, and, moving up the Saint Lawrence Valley, it disappeared on the 13th beyond the limits of the chart. On the 11th, 12th, and 13th abundant rains fell in the Northwest, Lake region and Saint Lawrence Valley. Cautionary signals were ordered on the 10th for Lakes Superior and Michigan; on the 11th for Lakes Huron, Erie, and Ontario. These signals were generally justified by the following maximum velocities: Duluth, 26 NW.; Escanaba, 26 S.; Milwaukee, 32 S.; Grand Haven, 36 S.; Alpena, 25 S.; Port Huron, 30 N.; Detroit, 29 S.; Toledo, 28 SE.; Sandusky, 32 S.; Cleveland, 27 S.; Erie, 29 S.; Rochester, 34 SW.; Oswego, 26 NE.

No. II.—On the 12th and 13th the pressure was low in Nevada and Utah preceding the development of a center of depression. On the 14th the low area moved into the Lower Missouri Valley. On the 15th the center of depression advanced with increasing energy and great rapidity over Lakes Michigan and Huron to the mouth of the Saint Lawrence. Cautionary signals were ordered for this storm at all the lake ports. The following are the maximum wind velocities reported: Marquette, 28 NW.; Milwaukee, 34 W.; Grand Haven, 35 S.; Alpena, 28 S.; Port Huron, 30 SW.; Detroit, 27 SW.; Toledo, 28 SW.; Sandusky, 36 SW.; Cleveland, 34 SW.; Buffalo, 26 SW.; Rochester, 28 SW. Cautionary signals were also displayed for this storm on the Atlantic coast from Eastport to New York. The following maximum velocities were reported: Eastport, 25 W.; Boston, 25 W.; Thatcher's Island, 31 S.; Wood's Holl, 38 SW.; Newport, 30 SW.; New Shoreham, 26 SW.

No. III.—The fall in pressure and circulation of the winds in Nebraska and Kansas on the 16th indicated the development of a storm center in that region. On the 17th the depression moved across the Northwest and the Upper Lake region. On the 18th over the Lower Lakes and New England. Cautionary signals were displayed on the Upper Lakes and Lake Erie on the 17th, but in the Upper Lakes the storm displayed but slight energy. On Lake Erie the following maximum velocities were reported: Detroit, 30 W.; Sandusky, 30 NW.; Cleveland, 27 NW.; Erie, 26 NW. On the Atlantic coast: Thatcher's Island, 42 NW.; Boston, 26 NW.; Wood's Holl, 36 NW.; Newport, 26 NW.; New Shoreham, 36 N.; Sandy Hook, 44 N.; Barnegat, 35 NW.; Cape May, 43 NW.; Breakwater, 44 NW.; Chincoteague, 30 NE.; Cape Henry, 40 NW.; Kitty Hawk, 44 NE.; Hatteras, 36 NE. It will be noted that the high winds reported on the Atlantic coast occurred after the passage of the storm center and therefore are to be associated with the rising barometer which succeeded the low area.

No. IV.—On the 19th a depression of slight energy moved in an easterly track as charted over the Upper Lake region into the Province of Ontario. Cautionary signals were ordered for the ports in the Upper Lakes, but they were not justified.

No. V.—On the 22d the barometer was low and slowly falling in the Southwest. At the morning report of the 23d a depression had developed, central in Indian Territory. During the day the storm center moved in a northeasterly track into Indiana. On the 24th it advanced, with diminished energy, over the Lower Lake region, and on the 25th moved across New England. The cautionary signals ordered for this storm on Lakes Erie and Ontario were not justified.

No. VI.—On the 25th and 26th there was a great barometric depression central in Washington Territory, Oregon, and Idaho, which extended east of the Rocky Mountains. On the 27th a new center of depression appeared to be well defined in Colorado and New Mexico. During the day it moved slowly to the northeast, exhibiting but slight energy. On the 28th the storm center advanced into Minnesota and on the 29th it passed over the Lake Superior region beyond the limits of the chart. This storm did not develop any special energy. Cautionary signals were displayed on Lakes Superior, Michigan, and Huron and for the western ports of Lake Erie. The following maximum winds were reported: Duluth, 30 W.; Alpena, 28 SE.; Detroit, 27 S.; Sandusky, 27 S.; Cleveland, 29 S. It will be noted that more storm energy was exhibited on Lake Erie than near the track of the center of low area.

Hurricane at Manzanilla, Mexico.—October 27th, 3 p. m., strong gale from the NE., barometer fell rapidly from 29.1 to 28.0. At about 4.50 p. m. the gale increased to a hurricane, the center of which struck Manzanilla with terrific force and terrible disaster. 28th, 7.50 a. m., there was a lull in the storm of about ten minutes duration, when the wind suddenly changed to the SW. with hurricane force. Every building in the city without an exception was completely destroyed, entailing a loss in the aggregate of over $500,000. In the harbor there were present at the time of storm one ship, two barks, two schooners, together with several lighters and small boats. All the vessels except one bark were a total loss.

INTERNATIONAL METEOROLOGY.

International Charts, Nos. IV and V, accompany the present Review. The former is published for August, 1879, and continues the series of this chart commenced in January, 1877. Chart No. V is prepared for the month of October, 1879, and continues the series of this chart commenced in November, 1877. It will be observed that the numbers of these charts have been changed, being one less in each case. This modification affects only the numerical value and not the character of the charts, having been done because of the discontinuance some time since of the old Chart No. IV.

Chart No. IV shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of August, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. Two areas of low pressure, (29.70) are shown upon the chart for the present month, one situated over the Atlantic Ocean just south of Iceland, running eastward to include Scotland and westward to the 35th parallel; the other area embraces southwestern Siberia. The isobar of 29.8, commencing near 55° N., 55° W., passes southeastward, reaching the 50th parallel near the meridian of 30° W., thence eastward along that parallel to 10° W., where its course changes to NE., reaching the Baltic near Wisby; at this point it turns to the N., curving around the Gulf of Bothnia to the west and passing thence eastward to the White Sea; from this locality the isobar runs southwestward to near the Black Sea, thence eastward to the Caspian, where it curves again to the southwest, reaching the Mediterranean north of Beirut. This disposition of pressure places the western half of Russia and the whole of Asia, except scattering coast stations, within the area of 29.8. It will be seen that upon leaving the eastern coast of Asia the pressure gradually rises, being about 29.9 over the Japan Islands. If we may be allowed to base judgment upon the reports of isolated stations between the parallels of 60° and 70° N., it is safe to conclude that the area of 29.8 surrounds the Arctic Ocean. The pressure over the United States nowhere falls below 29.9, except in California, where, in the central portion of the State a small area of 29.8 probably exists. Over British India the pressure ranges from 29.4 to 29.8. The area of highest pressure (30.2) covers a very irregular portion of the ocean southwest of the Azores. In the United States the maximum pressure (30.0) covers the Gulf and South Atlantic States, Tennessee, and the Ohio Valley. In Europe the barometer is everywhere below 30.0 except in extreme southwestern France, northern Spain, and in Portugal. The extreme mean pressures for the month are 29.4 (lowest) at Lahore and 30.23 (highest) at Ponta Delgado. The extreme monthly range of mean pressure is 0.83 inch, which is 0.05 inch larger than August, 1877, and 0.12 inch larger than August, 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: lowest, Godthaab, York Factory, and Fort St. Michaels, 45°; Stykkisholm, 53°; Moose Factory, 57°; Nikolaievsk on the Amoor, 58°; highest, Biskra, 102°; Laghouat, 97°.2; Saida, 91°.9; Tebessa, 91°.8; Lahore, 91°; Beirut, 88°; Tashkend, 86°. The prevailing direction of the winds over the United States was southwest to northwest along the Middle Atlantic and New England coasts, in the Lake region and over the Canadian maritime provinces; northeasterly along the South Atlantic and Gulf coasts; southerly in the interior and westward to the Pacific. Over the Atlantic Ocean, northeast to southeast and southwest south of parallel 40° N., and to the northward of that parallel southwest to northwest. Over Europe, south to west in Scandinavia and the British Isles; southwest to northwest in the interior; elsewhere variable. In Algeria northerly. In Hindostan westerly, and along the Asiatic coast southwesterly. Compared with August, 1877 and 1878, the temperature over the United States is generally higher over the Plateau and Pacific Coast regions and in southern Texas, elsewhere it is lower, particularly over the interior and in the eastern districts. The pressure is everywhere lower, being most marked on the Pacific Coast and in the Gulf and Atlantic coast States. Over the Atlantic, where comparison can only be made with 1878, the region of highest pressure shows an increase of from 0.1 to 0.15 inch. There is a general rise south of the 40th parallel, while to the northward the deficiency ranges from 0.05 to 0.2 inch, being most marked between the parallels of 55° and 65° N. The temperature is lower between the parallels of 50° and 60° N., but to the southward there is very little change. Over Europe there is a general rise in pressure south of the 50th parallel, being most marked along the northern shores of the Mediterranean, while to the northward the reverse takes place, principally over Scandinavia and the northern portion of the British Isles. With regard to the temperature there is a very marked rise over northern Europe, particularly Scandinavia and northwestern Russia; in the interior there is a slight fall, which disappears to the southward, where along the Mediterranean there is little or no change. In Algeria there is quite a marked rise in temperature and a decided fall in pressure. In Hindostan the changes in temperature and barometer are quite irregular; in the northern Provinces there is a general fall in both, while to the southward the deficiency in pressure is quite evident. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of August, 1879, as compared with the means of the past two years.

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.'		
	August, 1877–'78.	August, 1879.	Departure.	August, 1877–'78.	August, 1879.	Departure.
	°	°	°			
York Factory	49.8	45.1	—4.7	29.84	29.98	+0.14
Godthaab	45.9	45.1	—0.8	29.92	29.74	—0.18
Stykkisholm	50.9	53.1	+2.2	29.93	29.74	—0.19
Tromso	50.0	58.5	+8.5	29.80	29.75	—0.05
Thorshavn	51.8	52.0	+0.2	29.89	29.72	—0.17
Archangel	57.6	61.3	+3.7	29.73	29.82	+0.09
Ekaterinburg	64.2	60.6	—3.6	29.73	29.70	—0.03
Barnaul	70.4	62.4	—8.0	29.77	29.68	—0.09
Yeneisk	66.8	58.5	—8.3	29.74	29.77	+0.03

Comparative thermometric and barometric means, with corresponding departures—Continued.

Station.	Mean temperature,			Mean barometer.		
	August, 1877-'78.	August, 1879.	Departure.	August, 1877-'78.	August, 1879.	Departure.
	°	°	°			
Nikolaievsk on the Amoor	59.3	58.1	—1.2	....	....	....
Pekin	75.2	77.4	+2.2	29.79	29.72	—0.07
Zi-Ka-Wei	75.9	80.2	+4.3	29.82	29.80	—0.02
Tokei	75.5	77.4	+1.9	29.87	29.82	—0.05
Tashkend	79.7	86.0	+6.3	29.75	29.63	—0.12
Nukuss	84.8	85.8	+1.0	29.76	29.73	—0.03
Beirut	90.0	88.0	—2.0	29.80	29.74	—0.06
Mauritius	72.2	70.9	—1.3	30.19	30.18	—0.01
Fort Napier	69.1	69.8	+0.7	30.01	30.04	+0.03
Cape Town	59.3	62.2	+2.9	30.20	30.17	—0.03
Free Town	80.4	78.8	—1.6	30.00	30.00	N'm'l
Paramaribo	81.7	81.2	—0.5	30.03	30.01	—0.02
Funchal	76.9	75.0	—1.9	30.10	30.12	+0.02
Ponta Delgado	75.2	78.1	+2.9	30.08	30.23	+0.15
Angra	72.2	74.3	+2.1	30.07	30.18	+0.11
Bridgetown	85.0	82.5	—2.5	30.00	29.95	—0.05
Navassa	81.7	83.2	+1.5	29.98	29.95	—0.03
Medellin	71.6	65.6	—6.0	....	....	....
San Jose de Costa Rica	65.9	67.1	+1.2	....	....	....
Mexico	56.7	56.7	N'm'l	30.13	30.00	—0.13
Melbourne	50.1	49.6	—0.5	30.11	30.12	+0.01
Hobart Town	49.8	47.4	—2.4	29.83	30.01	+0.18
San Juan de Puerto Rica	81.9	80.4	—1.5	29.99	29.99	N'm'l
Nassau	84.3	84.1	—0.2	30.01	29.99	—0.02
Havana	81.4	82.5	+1.1	30.00	29.95	—0.05
Astrakhan	79.4	81.0	+1.6	29.88	29.82	—0.06
Athens	87.8	88.7	+0.9	29.89	29.89	N'm'l
Lahore	95.2	91.4	—3.8	29.50	29.48	—0.02
Tiflis	84.4	83.7	—0.7	29.80	29.78	—0.02
Laghouat	94.1	97.2	+3.1	30.08	29.98	—0.10
Fort de France	80.7	79.2	—1.5	29.91	29.82	—0.09
Yokohama	73.9	77.8	+3.9	29.83	29.83	N'm'l
Lisbon	76.9	75.7	—1.2	30.03	30.05	+0.02
Madrid	83.1	92.8	+0.7	....	....	....
Cagliari	85.4	84.7	—0.7	29.93	29.97	+0.04
Gibraltar	78.9	81.9	+.30	29.96	29.97	+0.01
Sandwick Manse	57.0	56.0	—1.0	29.80	29.69	—0.11
Malta	84.7	83.9	—0.8	29.95	29.94	—0.01

Chart No. V.—This chart displays the tracings of the probable courses of thirty-one of the principal storm areas of the Northern Hemisphere for the month of November, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from the logs of vessels of the merchant marine of the North Atlantic Ocean. Concerning the general distribution of the paths of the areas of barometric minima the following is given: Fourteen areas traversed portions of the United States, but none of them were entirely confined to its boundaries; four of these came from the Pacific Ocean between the parallels of 40° and 50° N.; five first appeared in the Rocky Mountain regions; ten reached the Atlantic Ocean, four of which crossed the same to the mainland of Europe. Of the storms over the Atlantic, one came from the West Indies; one formed in the vicinity of the Azores, and one in the vicinitn of the Cape Verd Islands. Of the storms over Europe, six came from the Atlantic Ocean one of which entered the continent over Portugal and the remainder came from betwery the parallels of 60° and 70° N.; one storm was confined almost entirely to the Mediteiranean, while another first appeared in the vicinity of the White Sea. Off the Asiatn coast three storms first appeared over the China Sea and two others formed over the ocea, southeast of the Japan Islands, all moving to the northeastward. Of the storms in North America, No. I appeared in the Lower Missouri Valley during the 1st, accompanied by heavy snow-falls and brisk to high winds. By morning of 2d it covered Lake Michigan, and during the day passed eastward over the Lower Lake region, accompanied by dangerous winds and heavy snow; 3d, central in southern New York and by the following morning had passed eastward over the ocean south of Nova Scotia. Following the passage of this area off the New England coast heavy northerly and westerly gales, with snow, prevailed during the latter part of the 3d and throughout the 4th. 3d, in 39° N., 66°, 40′ W., heavy N. gale, bitterly cold, stormy sea; in 43°, 36′ N., 59°, 24′ W., violent westerly gale; in 42° N., 64°, 58′ W., WNW. to NE., very changeable and stormy. 4th, in 45°, 01′ N., 54°, 06′ W., SE. to SW. gales, with fog and snow; in 40°, 27′ N.

41°, 44′ W., northeasterly gales, with violent squalls of snow and hail; in 42°, 21′ N,. 64°, 26′ W., ESE., SW., and W., fierce squalls; in 43° N., 52° W. gale from ESE., veering to W., with very high confused sea and heavy rain. 5th and 6th, depression moved slowly northeastward in the vicinity of 50° N. and between the parallels of 30° and 50° W. Vessels arriving in New York Harbor on the 6th reported the experience of violent gales and heavy snow during the 4th and 5th, the latter having collected to the depth of from 6 to 10 inches on their decks. 5th, large icebergs were encountered in 47°, 08′ N., 47°, 30′ W., and in 47° N., 47°, 40′ W. 6th, in 50°, 08′ N., 41°, 45′ W., SW. to NW, strong gale, heavy cross-seas; in 46°, 25′ N., 42°, 15′ W., S. to NW. fresh gale, high sea; in 49°, 46′ N., 43°, 40′ W., a chain of icebergs was encountered bearing from NNE. to S. by E., and small pieces were scattered in all directions. During the 7th, as the central area passed northward off the western coast of Iceland the barometer at Stykkisholm fell from 29.76 to 29.09 by morning of the 8th, winds shifting from SW. to S. and W. As the depression moved eastward near parallel 70° N. the pressure rose rapidly over the island (0.74 inch in twenty-four hours), with winds shifting to east. 9th, central off the northwestern coast of Norway; Brono, 29.21, a fall of 0.64 inch in past twenty-four hours, SW., heavy rain; Tromso, 29.21, a fall of 0.47 inch, S., cloudy; Bergen, 29.84, a fall of 0.34 inch, S., heavy rain. 10th, central over Lapland; Haparanda, 28.83, NW., a fall of 0.86 inch; Tromso, 29.19, NW.; Archangel, 28.98, a fall of 0.80 inch, SE., snow; St. Petersburg, 29.42, a fall of 0.62 inch, WNW., cloudy. 11th, central east of the White Sea; Archangel, 29.00, SSW., cloudy. 12th, central south of the Gulf of Ob, disappearing on the following day north of Yeniseisk, at which station southerly winds and snow had prevailed since the 11th. No. IV.—On the 4th an extensive area of low pressure entered North America from the Pacific Ocean near the 50th parallel and moved slowly eastward in that latitude, reaching Manitoba by the 7th, where the central area was inclosed by the isobar of 29.40. During this day and the following the depression moved slowly eastward over the southern portion of Hudson's Bay Territory, the barometer at Moose Factory, James's Bay, falling to 29.28, wind SW., force 6. 10th, passed eastward off the southeastern coast of Labrador and by the morning of the 12th had probably reached the ocean in the vicinity of 60° N., 40° W. The following data is from Godthaab during the passage of the depression to the south and east of Greenland: 10th, 29.89, ENE.; 11th, 29.74, ENE.; 12th, 29.38, NE.; 13th, 29.17, N.; 14th, 29.32, WSW.; 15th, 29.49, NNE. On the approach and passage of the depression Stykkisholm, Iceland, reported the following: 12th, 30.26, E.; 13th, 29.59, SE., rain; 14th, 29.24, S., rain; 15th, 29.16, calm, rain; 16th, 29.30, SW., rain; 17th, 29.40, S., rain; rain continued at this station until the 21st. 17th, depression central off the western coast of Norway; Tromso, 29.12, a fall of 0.65 inch, SW., rain; Brono, 29.60, a fall of 0.37 inch, WSW., threatening; Christiania, 29.89, a fall of 0.19 inch, SSW., rain and snow. 18th, disappeared north of Scandinavia, the pressure at northern stations rising rapidly from 0.10 to 0.60 inch and winds shifting to south. No. VIII.—This area developed over the Middle Plateau during the 6th and 7th, and passed rapidly eastward into Colorado and thence northeastward to the Upper Lakes, accompanied in Arkansas and Missouri by violent local storms. During the 9th, moved eastward over northern Canada, reaching the Gulf of Saint Lawrence by the 10th, and a position in about 50° N., 50° W., by the 11th. 12th, central in about 50° N., 40° W.; in 49° N., 41°, 30′ W., 29.34, NW., force 6; in 49°, 20′ N., 31°, 40′ W., 29.15, S., heavy rain; in 50°, 40′ N., 31°, 25′ W., 29.50, SSE., force 6; in 51°, 19′ N., 35°, 55′ W., SE. strong gale, rain, heavy sea; in 38° N., 42° W., hurricane from NW. for thirty-six hours, hove to under bare poles for twelve hours. 13th, in 50°, 01′ N., 43°, 36′ W., W. to NW., fresh gales; in 48°, 32′ N., 37°, 11′ W., 29.32, S. to N., stormy, very high sea; in 49°, 20′ N., 38°, 15′ W., 29.34, N., violent gale, with rain. 14th, in 42° N., 38° W., hurricane from SW. to NNE.; in 41°, 20′ N., 41°, 50′ W., sudden gale, wind came from N. with great fury and in three hours raised a tremendous sea, decks swept; in 40° N., 41° W., heavy gale from NE. to NW., lasting twenty-four hours, then shifting to SW. and continuing for eight hours; in 47°, 10′ N., 43°, 50′ W., 29.72, NW., hurricane; in 48°, 30′ N., 30°, 45′ W., 29.65, NW., violent gale. 15th, in 27° N., 36° W., heavy gale from WSW., lasting thirty-six hours; in 40° N., 40° W., hurricane from SE. to NW., high confused sea; in 41° N., 36° W., violent N. gale and tremendous sea, vessel thrown on beam ends and abandoned. 16th, together with area No. IV then central off the eastern coast of Iceland an elongated area of low pressure (generally below 29.60) extended southward to near the Azores. On the 17th areas No. IV and No. VIII combined to the northward of the British Isles, accompanied by a rapid fall in the barometer, the central area being inclosed by the isobar of 29.20. No. X.—This area appears to have moved southward along the North Pacific coast to near the 35th parallel, when it changed its course to the eastward, crossing California south of San Francisco, at which station the barometer fell to 29.26, the lowest reading reported in the past nine years. Its passage through the Middle and Southern Plateau regions was accompanied by heavy snow and rain. From Colorado northeastward the depression moved very rapidly to Lake Superior by afternoon of the 11th and thence southeastward over Canada to northern New York, disappearing during the 12th and 13th over the Canadian maritime provinces under the influence of areas Nos. VIII and XII, probably combining with the former off the Banks of Newfoundland. No. XII.—Following the passage of area No. X over the Southern Plateau the pressure remained comparatively low, developing on the 11th an area of 29.60 over New Mexico. During the 11th this depression moved east-northeast to the Upper Mississippi Valley, where it was central morning of the 12th. From this position it moved eastward over the Lake region, accompanied by storms of wind and rain; heavy thunder-storms were experienced in southern New York. 13th, central off the Massachusetts coast and during the day probably disappeared in a trough of low pressure extending westward from 44° N., 35° W., to near 65° W. No. XIII appeared off the North Pacific coast during the 13th and passed rapidly eastward over the northern territories, reaching Lake Superior by morning of the 15th, where the central area was inclosed by the isobar 29.60, the lowest barometer being at Duluth 29.42. Owing to the presence of area No. XVII, on this day central south of Lake Erie, an extensive area of barometric minima formed over the Lake region, Ohio Valley, and Canada which, during the day, combined the effects of the two areas resulting in a single area (No. XVII), which, on the 16th, became central over Newfoundland. No. XIV.—Resulting from a general fall in the barometer from Texas northward to Hudson's Bay forming a barometric trough of 29.80, this depression appeared central in the southern portion of the Upper Mississippi Valley on the 13th. During the day it passed northeastward to Lake Michigan, accompanied in the States of Illinois, Indiana, and Kentucky by heavy rains and thunder-storms, causing considerable damage to property. On the 14th passed northeastward into northern Canada, disappearing on the following day as an individual area in the extensive depression formed by the combination of areas Nos. XIII and XVII over the Lake region and Canada. No. XVI.—This area first appeared over the Middle Rocky Mountain region where, on the 15th, it was accompanied by snow and high westerly winds. During the 16th the central depression extended rapidly southeastward into Texas, followed by northwesterly winds and increasing precipitation. From Texas the course of the depression changed to east-northeast, moving across the northern portion of the Gulf States and thence northeastward passing off the Virginia coast near the 37th parallel on the 18th. During this portion of its course after leaving the Gulf States, the winds shifted to northerly over the Lower Lakes, accompanied by heavy snow-storms and severe gales with considerable loss to shipping. Over the ocean an extensive area of low pressure formed in the vicinity of 35° N., 70° W., accompanied by violent gales and much damage to shipping. 18th, in 39° N., 66° W., hurricane from SE. to NW., lasting five hours, then to SW., lasting three days; off Cape Lookout, 3 a. m. took heavy NE. gale, wind suddenly shifted to SE. and about two hours thereafter veered to SW. In 41°, 42′ N., 64°, 40′ W., 8 p. m., ESE., gale rapidly increasing in force and slowly veering to the SE. and S., barometer rapidly fell to 29.47. 19th, passed northeastward south of Nova Scotia and disappeared as an individual depression under the influence of area No. XVIII advancing from the southwest, or possibly by a rapid movement eastward continued as area No. XX central north of the Azores on the 19th. On this day an area of low pressure (probably about 29.70) prevailed over the ocean between the parallels of 35° and 45° N. and the meridians of 20° and 60° W. In 40°, 09′ N., 68°, 56′ W., 6.30 a. m., wind shifted from SE. to NE., increasing northerly sea, barometer rising; at midday wind again shifted through W. to NE., with hurricane force, barometer 29.50; at evening wind shifted to NW., with hurricane force, very heavy NW. sea. In 33°, 37′ N., 73°, 20′ W., heavy gale from NW., lasting ten hours, barometer 29.25; in 39° N., 68° W., heavy gale from ESE. to WNW., tremendous sea; in 42°, 38′ N., 53°, 24′ W., NNW., SW. SE. and W., strong gales and rain; towards morning strong westerly gale and heavy cross-sea. In 47°, 25′ N., 44°, 28′ W., NW., and W., severe gales, barometer falling rapidly; in 35°, 30′ N., 55°, 14′ W., hurricane from W. to NW., lasting twenty hours. No. XVII.—This area developed over the Lower Lakes on the 15th as an offshoot of an extensive area of barometric minima covering the country between the parallels of 40° and 50° N., and the meridians of 70° and 100° W. During the day this depression passed northeastward to the Gulf of Saint Lawrence, where it was central on the 16th, moving thereafter to the southeast over Newfoundland, being central by morning of the 17th in the vicinity of 50° W. In 44°, 50′ N., 53°, 20′ W., 29.87 NNW., force 7; in 50°, 56′ N., 44°, 48′ W., SW. to NW., strong storm, high seas. During the day course of depression changed to the NE., being central on the 18th in about 50° N., 30° W., after which it again changed, moving almost directly north to the western coast of Iceland, rounding the island to the northward and passing thence eastward to northern Scandinavia. 18th, in 50°, 50′ N., 32°, 10′ W., heavy SE. gale shifting to NE., with high confused sea. The following observations were reported from Stykkisholm, Iceland, during the advance and passage of the depression: 18th, 29.29, SW., force 5, rain; 19th, 29.74, calm, rain; 20th, 29.64, S., force 6, rain; 21st, 30.33, SW., force 1, clearing; 22d, 30.63, NE., force 4, fair. Owing to the presence of an extensive area of high pressure over the

British Isles and to the westward over the ocean, the change in pressure over Iceland during the passage of the depression was extremely sudden. On the 22d, with diminished energy, the depression became central off the northwestern coast of Norway and during the day passed southeastward into Finland. 24th, central southeast of the White Sea, followed to the westward over Finland and vicinity by S. to N. and NW. winds, with snow. 25th, central in western Siberia, with slowly increasing pressure; Kasan, 29.89, NNW., snowing; Ekaterinburg, 29.82, SW., threatening. 26th, central in the valley of the Yenisei, disappearing thereafter over central Siberia; Yeniseisk, 29.72, a fall of 0.21 inch in past twenty-four hours, W., threatening; Barnaul, 30.04, a fall of 0.43 inch, SW., cloudy. No. XXII.—During the 18th, while No. XVI occupied the South Atlantic coast, a very sudden fall in the barometer occurred over the Lake Superior region and to the northward, developing on the following morning into an area of 29.40. 19th, Moose Factory, 29.26, a remarkable fall of 1.13 inches in past twenty-four hours, wind S., force 6, heavy snow-storm; Marquette, 29.51, a fall of 0.89 inch, winds from N. to W.; Duluth, 29.66, a fall of 0.82 inch, winds from NW. to SW.; Alpena, 29.69, a fall of 0.67 inch, winds from N. to SSW. During the day the storm passed southeastward over the Lake region, where heavy southwest to northwest gales, with snow, prevailed, driving many vessels ashore and wrecking others. This storm proved to be one of the severest for many years upon the Lakes, causing great damage by shipwreck and the loss of many lives. Over Canada and New England the storm was equally severe, being accompanied by violent southwest to northwest winds and snow. By afternoon of the 20th the depression had combined with No. XVIII, the West India hurricane, then central off the Nova Scotia coast; lowest barometer at Halifax, 28.59, a fall of 1.10 inches in past twenty-four hours. Magdalen Islands, violent gale from SE. veering to NE., and increasing to a hurricane. Strait of Canso, heavy SE. gale. At Cow Bay, Louisburg, and Glace Bay, hurricane from SE. to SSW. On the Gaspe coast and in Northumberland Strait, heavy NE. gales accompanied by high tides, the latter causing considerable damage at Point du Chêne. A further description of this storm is to be found under area No. XVIII, of which it formed a part on and after the 20th. No. XXIII.—This area passed southeastward from the Saskatchewan Valley during the 20th and 21st and by morning of the 22d was central north of Lake Superior inclosed by the isobar of 29.40. During this day the depression passed southeastward over the Upper Lake region followed by winds shifting from SW. to NW., increasing to high and accompanied by snow. Central over the Province of Ontario on the 23d the depression changed its course more to the east, reaching the Gulf of Saint Lawrence by the following morning, disappearing thereafter in an area of high pressure (30.30) prevailing to the southward. XXV.—Following rapidly the passage of the preceding area the pressure on the 24th again fell in the Northwest and Manitoba; Fort Garry, 29.48, a fall of 0.80 inch in past twenty-four hours; Pembina, 29.49, a fall of 0.75 inch; Breckenridge, 29.67, a fall of 0.67 inch. During the day the depression passed rapidly northeastward to Hudson's Bay, lowest barometer, 29.41, at Moose Factory, James Bay, a fall of 0.50 inch in past twenty-four hours. During the 25th the area passed eastward into Labrador, and disappeared on the following day under the influence of a high pressure (30.20 to 30.40) to the southward. No. XXIX.—This depression appearing in Idaho on the 25th, probably passed southward from the British Possessions during the continuance of an extensive area of low pressure which prevailed over the Saskatchewan Valley on the 24th, and later moved eastward as area No. XXV. During the 25th and 26th, the depression moved southeastward into New Mexico; thence changing its course to the northeast it reached the Upper Lake region by morning of the 28th, where the central area was inclosed by the isobar of 29.60, and the area of precipitation embraced the Lake region, the Ohio and Upper Mississippi Valleys, in the first of which regions a severe storm of wind, rain, and snow prevailed throughout the day. 29th, central over northern Maine with diminished energy, the latter fact owing to the presence of three areas of high pressure (30.40) situated as follows: one in 55° N., 30° W., another in 40° N., 55° W., and the third in 35° N., 95° W. 30th, depression central over the Gulf of Saint Lawrence. The further course of this area will appear on the December chart. No. XXX.—On the 26th, an extensive area of barometric minima covered the country between the parallels of 30° and 45° N., and from the 95th meridian westward to the Pacific. This depression embraced the present area and No. XXIX, the latter then central in the Middle Rocky Mountain region. During the 27th and 28th, area No. XXX moved northeastward over the Lake region and Canada, in connection with No. XXIX, but somewhat in advance of and a little to the north of the latter. On the 29th these two areas combined in the Lower Saint Lawrence Valley, moving eastward thereafter as area No. XXIX. No. XXXI.—The presence of this area on the North Pacific coast, on the morning of the 29th, caused general rain throughout northern California, Oregon, and Washington Territory, and a fall in pressure of from 0.20 to 0.40 inch. During the day the depression moved northeastward into the British Possessions, where on the morning of the 30th it appeared central in the Saskatchewan Valley. Its course thereafter will probably appear on the December chart. Of the storms over the Atlantic the following descriptions are given: No. XVIII, a storm of cyclonic origin, probably developed on the 16th over the Caribbean Sea, south of Hayti; Saint Thomas, 29.97, SE., heavy rain; Navassa, 29.89, N., fair; Kingston, Jamaica, 30.12, NW., fair; Navana, 30.03, calm, clear; Nassau, 30.06, NE., fair. 17th, Saint Thomas, 29.93, SE., cloudy; Navassa, 29.85, NE., cloudy; Kingston, Jamaica, 30.10, calm, fair; Havana, 30.00, calm, clear; Nassau, 30.03, NE., fair. 18th, probably central over eastern Cuba; Navassa, 29.87, NE., fair; Kingston, Jamaica, 30.09, calm, fair; Nassau, 30.04, NE., threatening; Havana, 29.94, calm, fair; Grand Turk, Bahamas, 20.75, a fall of 0.10 inch in past twenty-four hours, ESE., strong gale. 19th, Nassau, 29.86, SE., fair; Grand Turk, Bahamas, 29.70, S., strong gale; Havana, 29.87, SW., cloudy. During the day the depression curved to the northeast in about 30° N., 78° W., and the southwesterly winds accompanying area No. XVI along the South Atlantic coast shifted to N. and NE., with rain and slowly falling pressure. Over the ocean heavy gales were experienced, causing much damage to shipping, as follows: shooner Victor, from Baracoa, Cuba, to New York, had severe NW. gales in Gulf Stream, lasting twelve hours; schooner Kit Carson, from Miragoane, Cuba, for New York, experienced very violent NNE. gales, vessel fell off in trough of sea, decks swept; ship Stewart Freeman, 200 miles off Cape Henlopen, had hurricane from NW. and was blown off nearly to the Bermudas; in 36° N., 75° W., severe NNW. gale; in 34° N., 72° W., severe hurricane from E. by S. 20th, depression central in about 38° N., 70° W., inclosed by the isobar of 29.00; in 34°, 06′ N., 73°, 41′ W., hurricane from east veering to NW., last several hours; in 34°, 60′ N., 73°, 30′ W., brig Shannon, from Cape Haytien to New York, had revolving gale beginning at ENE., and backing to NNW., perfect hurricane, heavy cross-seas; in 41°, 13′ N., 63°, 18′ W., terrific gale from SE. to NW., veering to S. and lasting forty-eight hours; ship Devenon, north of Cape Hatteras, terrific gale from SSW., veering to N., vessel on beam ends for six hours; in 32°, 05′ N., 70°, 30′ W., bark B. F. Watson, on edge of revolving gale beginning at S. and hauling to W., barometer 29.30; in 34°, 31′ N., 70°, 10′ W., hurricane from SW. veering to NW., lasting twenty-four hours; in 32°, 20′ N., 73°, 20′ W., very heavy storm commencing at ESE., and veering suddenly to W., heaviest from WSW., lasting four hours and then settling down to a heavy gale from the NW., which continued for thirty-six hours; in 42°, 30′ N., 61°, 30′ W., SE. to SW., heavy gales, barometer fell to 28.90; in 38°, 22′ N., 69°, 30′ W., terrific gale from SW., veering to NW., lasting forty-eight hours. On the 20th, as the storm advanced northeastward, northerly gales with light to heavy snow prevailed over the Canadian maritime provinces; on Newfoundland Banks, hurricane from ESE., with a blinding snow-storm and tremendous sea; on Manicougan Shoals, mouth of Saint Lawrence, 7 p. m., violent snow-storm. After combining with area No. XXII off the Nova Scotia coast, the depression by morning of the 21st was probably central, but with diminished energy over the Gulf of Saint Lawrence; Sydney, C. B., 29.15, a fall of 0.68 inch, SW., cloudy; Chatham, 29.11, a fall of 0.69 inch, W., cloudy; Charlottetown, 29.09, a fall of 0.66 inch, W., clearing; in 38°, 50′ N., 61°, 56′ W., terrific squalls and tremendous sea, vessel thrown on beam ends; in 40°, 25′ N., 72°, 54′ W., WNW., hard gale, high sea; in 43°, 28′ N., 56°, 38′ W., hard gale from WNW., shifting to SW. 22d, depression central in about 50° N., 45° W., followed over the Canadian maritime provinces by westerly winds, rising pressure, and clearing weather; in 43°, 06′ N., 53°, 18′ W., W., strong gale, fierce hail squalls, high confused sea; in 46°, 30′ N., 51°, 26′ W., SW. to W., strong gale, high sea; in 40°, 52′ N., 63°, 37′ W., W. by N. and NW., strong gale, high sea, clearing weather; in 40°, 45′ N., 60°, 29′ W., NW., strong gale, fierce squalls. By morning of the 23d the depression had disappeared under the influence of a high pressure area (30.40) which rapidly advanced from the southwest and combined with a similar area occupying the ocean in the vicinity of 50° N. 30° W. No. VI.—During the 5th the barometer fell from 0.10 to 0.30 inch in the vicinity of 25° N. 25° W., developing on the 6th an area of 29.80, with the lowest pressure, 29.74, in 24°, 14′ N., 23°, 30′ W., accompanied by SW. squalls and rough sea. From the 6th to the 8th the depression moved slowly northward to the Azores, where on the latter date the lowest pressure was reported from Ponta Delgado, 29.74, a fall of 0.17 inch in past twenty-four hours, wind NE. On this day the depression curved to the eastward, followed on the 9th by a rise in pressure of from 0.10 to 0.20 inch over the Azores, with clearing weather. During the 10th and 11th disappeared in an area of high pressure (30.40) which moved southwestward from the Bay of Biscay. No. XX.—As previously stated under the description of area No. XVI, which on the 19th was central south of Nova Scotia, a very extensive area of low pressure covered the ocean on this day between the parallels of 40° and 50° N. Reports from the logs of vessels are not sufficiently numerous and reliable to decide the probability of a connection between areas No. XVI and XX so far, at least, as to say that they were one and the same storm. Central north of the Azores on the 19th, with the lowest pressure about 29.75, the depression moved southeastward. On the morning of the 21st the central area was inclosed by the isobar of 29.40, but by the following morning with a further movement eastward the pressure had rapidly increased and the depression was marked by the isobar of 29.70. During the 22d and 23d disappeared under the influence of a high pressure area (30.20) over Algeria and southern Spain. No. XXIV.—Immediately following the disappearance of area No. XX the pressure fell over the ocean south of the Madeira Islands, and on the 23d the barometer at Funchal rose 0.10 inch, with winds shifting from SW. to ENE. 25th, depression central between the Azores and Madeira Islands; Ponta Delgado, 29.62, a fall of 0.33 inch in past twenty-four hours, wind shifted from E. to NE., force 6; Angra, 29.80, a fall of 0.21 inch, wind NE.; Funchal, 29.58, a fall of 0.20 inch, wind shifted from NE. to S. Along the coasts of Portugal and Spain the barometer fell from 0.10 to 0.20 inch, with southerly winds and rain. 26th, depression changed its course to the eastward, being central north of the Madeira Islands; Funchal, 29.31, a fall of 0.25 inch, SW., rain; in 31°, 35′ N., 16°, 50′ W., 29.35, SW., force 7, rain; Ponta Delgado, 29.49, NE., force 6, rain. 27th, central off the coast of Portugal; Lisbon, 29.19, a fall of 0.44 inch, SW., heavy rain; Santiago, 29.28, a fall of 0.39 inch, NE., force 7, heavy rain; in 35°, 40′ N., 14°, 25′ W., WNW., force 6, cloudy; Funchal, 29.48, W., clearing; Madrid, 29.45, S., cloudy; San Fernando, 29.54, a fall of 0.20 inch, SSW., rain. 28th, depression central, with increased pressure in northern Spain, lowest barometer at Santiago, 29.30. During the day passed eastward over the Mediterranean, being central on the 29th near Malta, inclosed by the isobar of 26.90. The barometer along the southern coast of France fell from 0.10 to 0.15 inch, with winds shifting to N. and NE., with rain. 30th, depression central, with diminished pressure over Italy, inclosed by the isobar of 29.40, lowest barometer, at Pesaro, 29.29, a fall of 0.43 inch in the past twenty-four hours; rain generally prevailed throughout the kingdom. The further course of this area will appear on the December chart. Of the storms over Europe the following descriptions are given:. No. II.—Following the passage over northern Scandinavia of area No. XVII of the October chart, the pressure on the 1st fell quite suddenly over southern Scandinavia, lowest barometer at Christiania, 29.38; rain quite general over Norway and Sweden, with northeast to southeast winds. 2d, depression central over the Baltic, pressure at the center gradually increasing; the area of precipitation greatly enlarged, embracing eastern Scandinavia, Germany, Austria, and western Russia; snow was reported from Brono, Dorpat, and St. Petersburg. 3d, central south of the Gulf of Finland, lowest barometer at St. Petersburg, 29.35, a fall of 0.36 inch in past twenty-four hours, NNE., snow; Dorpat, 29.39, a fall of 0.29 inch, WSW., cloudy; over the Baltic and to the southward the winds to northwesterly, with rising barometer and cloudy or partly cloudy weather, with occasional rain. 4th, central area greatly enlarged, a trough of low-pressure running from the Black Sea northeastward to the Arctic Ocean; lowest barometers at Archangel, 29.34, and Moscow, 29.39. 5th, central near 60° N., 50° E.; Kasan, 29.40, a fall of 0.25 inch, SW., snow; Ekaterinburg, 29.72, a fall of 0.35 inch, SSE., cloudy; Krotkowo, 29.50, a fall of 0.30 inch, W., cloudy. 6th, Ekaterinburg, 29.34, SSE., snow; Kasan, 29.74, W., cloudy; Krotkowo, 29.86, N. W., cloudy. 7th and 8th, disappeared in an area of high pressure (30.40) over central Siberia. No. V.—While area No. II covered central Russia on the 4th the present area appeared off the northwestern coast of Norway. On the 5th, the central depression occupied northern Scandinavia; Tromso, 29.22, a fall of 0.60 inch in past twenty-four hours, SW., rain; Brono, 29.38, a fall of 0.56 inch, SW., rain. On this day the isobar of 29.80 covered Scandinavia and more than two-thirds of Russia, running southeastward into Toorkistan. 6th, central over the Gulf of Finland, with the area of precipitation extending southwestward to France and south to Turkey; St. Petersburg, 29.48, SE., light snow; Dorpat, 29.34, ESE., light snow; Wilna, 29.48, SW., fair. 7th, central east of the White Sea, with greatly diminished energy; Archangel, 29.78, a rise of 0.13 inch, wind WSW. The rapid advance of a high pressure area (30.40) over Toorkistan and southwestern Siberia caused the disappearance of this depression on the 8th. No. IX.—This area succeeded No. V very rapidly, appearing over northern Norway, while the latter was yet central near the White Sea. 7th, Tromso, 29.41, a fall of 0.19 inch in past twenty-four hours, NE., rain; Haparanda, 29.71, E., snow; Brono, 29.49, a fall of 0.11 inch, WNW., rain. 8th, central southwest of the White Sea; Archangel, 29.15, a fall of 0.63 inch in past twenty-four hours, ESE., cloudy; St. Petersburg, 29.30, a fall of 0.56 inch, NW., light rain. 9th, central near 60° N., 50° E.; Kasan, 29.41, a fall of 0.75 inch in past twenty-four hours, S., cloudy; Krotkowo, 29.50, a fall of 0.80 inch, SW., cloudy. 10th, central over the Ural Mountains in the vicinity of 55° N.; Ekaterinburg, 29.39, a fall of 0.48 inch, calm, cloudy. 11th, central in the Province of Yeniseisk, but with greatly diminished energy, finally disappearing on the following day over northern Siberia. Yeniseisk reported a fall of 0.11 inch on the 11th, wind shifting from E. to ESE., with heavy snow. No. XI.—While area No. I was central on the 11th over the White Sea and before a complete recovery of pressure over Scandinavia the barometer fell with considerable suddenness over the Islands north of Scotland; Thorshavn, 29.42, a fall of 0.39 inch, NE., force 6, cloudy; North Unst, 29.50, a fall of 0.33 inch, S., cloudy; Sandwick Manse, 29.34, a fall of 0.69 inch, SW., cloudy. During the day depression passed southeastward into Denmark, where it was central on the 12th; Copenhagen, 29.30, a fall of 0.56 inch, E., rain; Fanoe, 29.27, a fall of 0.57 inch, calm, rain; the isobar of 29.60 covered nearly the whole of central Europe; rain prevailed very generally over the German Empire and eastern France. 13th, central over eastern Russia; Königsburg, 39.38, a fall of 0.14 inch, SW., heavy snow; Memel, 29.35, a fall of 0.15 inch, N., cloudy; rain or snow, with brisk to high northwest winds and gales, prevailed throughout Prussia and Bavaria and a thunder-storm was reported from Munich. 14th, central in southwestern Russia with increased pressure; Wilna, 29.52, calm; Kieff, 29.51, NW.; over the Baltic and throughout Prussia and Bavaria north to west winds, increasing gales, with rain, sleet, or snow, prevailed; at Berlin a hurricane was reported on the 13th and 14th. 15th, depression about stationary, with conditions unchanged to the westward. 16th, depression moved northward to near the Baltic coast, center rapidly filling up; the violent storms of wind, rain, sleet, and snow still continued to the south and west, but by morning of the 17th clearing weather, with winds shifting to east and south and rapidly rising pressure, prevailed. Depression on this day situated north of the Black Sea; Nikolaiev, 29.72, S., rain; Kieff, 29.79, NE., cloudy, huge piles of drifting snow. During the day the depression disappeared in a high pressure area (30.60) prevailing in the vicinity of the Caspian Sea. The peculiar movement of this area from the 13th to the 16th inclusive was probably due to the persistency of an area of high pressure over central and eastern Russia, which condition was not relieved until the 16th, when an area of 30.40 appeared over France moving northeastward, while at the same time No. IV covered the ocean between Iceland and Norway. No. XXI.—This area may have been a continuation of No. IV, which was lost sight of off the northern coast of Norway during the 18th, owing to the rapid advance northward of an area 30.60 over northern Europe. Perhaps the depression remained intact north of the 70th parallel, beyond which latitude we have no data, and put in an appearance on the 20th, in northwestern Siberia. 20th, Barnaul, 29.81, a fall of 0.79 inch in past twenty-four hours, SW., snow; Yeniseisk, 29.70, a fall of 0.52 inch, SW., snow. 21st, depression moving southeastward; Yeniseisk, 29.43, SW., snow; Barnaul, 29.52, SW., snow. 22d, Yeniseisk, 29.74, W., snow; Barnaul, 29.45, NW., snow. 23d, Yeniseisk, 30.24, SSW., fair; Barnaul, 30.47, W., clear. During the 22d depression disappeared over the Province of Irkoutsk in an area of high pressure (30.40) then prevailing in that region. No. XXVII.—Following the passage of area No. XVII over Scandinavia on the 22d the barometer again fell over the northern portion of this country, developing a depression on the 25th which by the following morning embraced northern Europe between the parallels of 60° and 70° N. and the meridians of 40° and 16° E.; lowest pressure at Haparanda, 29.78, NE.; Archangel, 29.82, ENE.; St. Petersburg, 29.83, SW., snow. On the morning of the 26th a small area of 29.80, with snow, appeared just north of the Black Sea, which during the day merged with area No. XXVII, forming a barometric trough extending southwestward from the White Sea and including the whole of central Russia. By morning of the 27th this extended depression contracted to small area of 29.40 situated in about 50° N., 30° E.; Kieff, 29.37, a fall of 0.43 inch, NNE., snow and fog; Nikolaiev, 29.39, a fall of 0.44 inch, NW., rain. During the day the depression curved to the northeast and with greatly diminished pressure was central, morning of the 28th, in central Russia; Kasan, 28.97, a fall of 0.94 inch, SE., snow; Moscow, 29.13, a fall of 0.63 inch, SE., cloudy; Archangel, 29.76, a fall of 0.17 inch, ENE., cloudy; St. Petersburg, 29.47, a fall of 0.09 inch, NW., light snow. 29th, central in northeastern Russia; Archangel, 29.51, NNE., cloudy; Kasan, 29.48, WSW., cloudy; Ekaterinburg, 29.24, a fall of 0.80 inch, SW., light snow; Moscow, 29.56, S., light snow. During the day depression passed eastward to the valley of the Obi, where it was central on the morning of the 30th, disappearing thereafter over northern Siberia in an area of high pressure, 30.20. No. XXVIII.—This area developed during the 24th and 25th over the Mediterranean south of France, pressure generally below 29.85, with cloudy weather, easterly winds and rain along the southern coast of France and the western coast of Italy. 26th, the isobar of 29.80 embraced the whole of southern Europe between the parallels of 38° and 46° N., and thence westward over the Atlantic to 35° W. This extended depression embraced two smaller areas, one 29.40 (area No. XXIV) and the other 29.70 (area No. XXVIII) the latter occupying the Mediterranean in the vicinity of Sardinia. During the 27th and 28th the depression moved southeastward off the western coast of Italy and was finally lost sight of through the influence of advancing area No. XXIV central on the 28th off the eastern coast of Spain. Of the storms off the Asiatic coast the following descriptions are given: No. III.—During the 1st the barometer along the southeastern coast of the Island of Nippon fell from 0.10 to 0.20 inch, developing on the 2d a depression which moved northeastward with comparatively slight energy; no violence was effected at land stations; 2d, in 38°, 47′ N., 148°, 27′ E., 29.92, NW., rough sea, cloudy; 3d, in 40°, 27′

N., 152°, 19′ E., variable winds, rough sea, rain. 4th, in 42°, 01′ N., 156°, 36′ E., 29.70, NW., rough weather, cross seas, rain. 5th, in 43°, 15′ N., 161°, 48′ E., 29.75, rough weather, cross seas, NW., hail; in 31°, 12′ N., 174°, 08′ W., 30.12, SW., moderate sea, cloudy. 6th, in 44°, 20′ N., 167°, 19′ E., moderate sea, NW., cloudy; in 31°, 12′ N., 179°, 88′ W., 30.06, SW., moderate sea, showery. 7th, in 45°, 04′ N., 172°, 09′ E., 29.85, N., moderate sea, hail; in 31°, 05′ N., 175°, 23′ W., 29.81, heavy SW., squalls, tremendous sea. On the 8th the depression disappeared in an area of high pressure (30.30) with clearing weather and easterly winds. No. VII.—This area formed over the China Sea during the 5th and 6th; on the latter date barometer at Hong Kong read 29.99, a fall of 0.13 inch in past twenty-four hours, wind shifted from NE. to N. with rain; Manila, Phillipine Islands, 29.83, a rise of 0.08 inch, wind shifted from SSW. to SE., followed by rain. 7th, Manila, 29.76, SE., cloudy; to the northward along the Japan Islands the winds were northeasterly with falling barometer and cloudy or threatening weather. 8th, Manila, 29.75, NNW., cloudy, 1.15 inches rainfall in past twenty-four hours; Zi-Ka-Wei, 30.32, rain, wind NNW.; pressure rapidly falling along the southern coast of the Japan Islands. 9th, Manila, 29.67, SW., rain; Nagasaki, 29.87, a fall of 0.27 inch in past twenty-four hours; Wakayama, 29.72, a fall of 0.41 inch, ENE., rain; Tokei, 29.78, a fall of 0.20 inch, NNE., rain; in 37°, 10′ N., 148°, 24′ E., 29.76, NNW., fair. 10th, Nagasaki, 29.96, N., clear; Manila, 29.78, E., clear; Wakayama, 29.70, N., fair; Tokei, 29.54, NNE., rain; in 37° 28′ N., 148°, 35′ E., 29.98, NNE., heavy sea, rain. 11th, depression passed to the eastward, followed over the Japan Islands by clearing weather, rapidly rising pressure, and wind shifting to east and northeast; in 38°, N., 148°, 50′ E., 29.89, NNW., heavy sea, fair; in 30°, 59′ N., 158°, 02′ E., 29.75, W., heavy squalls. On the 12th, disappeared to the eastward in an area of high pressure. No. XV.—This area suddenly appeared in the vicinity of 30° N., 150° E., developing on the 14th a depression inclosed by the isobar of 29.60; in 39°, 05′ N., 153°, 15′ E., 29.47, a fall of 0.78 inch in past twenty-four hours, NW., clear; in 33°, 19′ N., 144° 23′ E., 29.74, N., heavy squalls. During this day and the following the depression moved rapidly northeastward, and by morning of the 16th was lost in an area of high pressure (30.30) in the vicinity of 35° N., 165° E. No. XIX.—This depression developed over the China sea during the 17th and 18th, and moved northeastward south of the Japan Islands, disappearing on the 22d in the vicinity of 35° N., 165° E. Rain with northeasterly winds and the barometer generally above 29.90 prevailed during the 19th and 20th along the Japan coast; the depression was too far south to produce a decided effect along this coast. The following observations show the influence of the storm at Manila, Philippine, Islands: 18th, 29.84, NE., fair; 19th, 29.69 N., cloudy; 20th, 29.57 S., stormy, 4.50 inches rainfall in past twenty-four hours; 21st, 29.81, SE., very cloudy. No. XXVI.—During the 22d and 23d this storm developed over the China Sea south of the 20th parallel; 22d, Macao, 29.81, a fall of 0.13 inch in past twenty-four hours, wind NE., 8 hours rainfall; Manila, 29.83, SW., cloudy; in 24°, 59′ N., 119°, 25′ E., 29.89 NNE., cloudy. 23d, Macao, 29.84, NE., cloudy; Manila, 29.84, N., cloudy; in 22°, 19′ N., 115°, 16′ E., 29.78, WSW., cloudy. 24th, Hong Hong, 29.95, NW., fair; steamship Belgic, Hong Kong, 29.86, W., cloudy; Manila, 29.83, SW., 1.39 inches rainfall in past twenty-four hours. At Nagasaki and Zi-Ka-Wei the barometer fell from 0.04 to 0.12 inch, wind NE., light rain, but from Wakayama northeastward to Yokohama there was a slight rise, wind shifted from SW. to E. and NE. 25th, at Manila and Hong Kong wind shifted to N. and NW., with slowly rising pressure and clear or partly cloudy weather; over Japan rain was general with easterly winds and pressure about 30.00 except at Nagasaki where the barometer read 29.92. During the day depression shifted its course more to the east leaving the Japan Islands a greater distance to the north which caused a cessation of atmospheric disturbance in that region followed on the morning of the 26th by clear and clearing weather; slightly higher pressure prevailed from Nagasaki westward, and slightly lower northeastward to Yokohama. 27th, depression disappeared over the ocean in the vicinity of 30° N.. 155′ E. Along the Japan coast the barometer rose from 0.10 to 0.25 inch; winds shifting to N. and NW. with clear or partly cloudy weather.

TEMPERATURE OF THE AIR.

The mean temperature of the air for October, 1881, is shown by the isothermal lines (in red) on Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. The temperature is everywhere above the normal east of a line running from the Rio Grande Valley northeastward to Lake Superior. Within this extensive region of country the departures of excess range 1°.3 in New England to 6°.5 in the Eastern Gulf States. Mount

Washington shows a deficiency of 1°.1. Over the remainder of the country to the west the temperature is everywhere below the normal with but one exception, the Middle Rocky Mountain slope, where an excess of 5°.1 appears. The departures of deficiency range from 0°.8 in Minnesota to 6°.8 in the Northern Rocky Mountain slope. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1872, together with the corresponding districts: 1873, —5°.0 Upper Mississippi Valley, and —4°.5 Minnesota; 1874, +3°.0 Minnesota, and +2°.9 Upper Mississippi Valley; 1875, —4°.6 Saint Lawrence Valley, and —3°.7 South Atlantic States; 1876, —4°.0 Minnesota, and —4°.2 South Atlantic States; 1877, +4°.6 Lower Lake region; 1878, +4°.8 New England; 1879, +9°.04 Upper Mississippi Valley and Minnesota; 1880, —4°.0 Rio Grande Valley, and —3°.7 Southeast Rocky Mountain slope.

Ranges of temperature at signal service stations.—Monthly ranges in general varied from 35° to 50° over the country east of the Rocky Mountains and from 45° to 60° westward to the Pacific. The smallest ranges were: Key West, 18°; Punta Rassa, 23°; Brownsville, 25°; San Diego and San Francisco, 27°; Galveston, 28°; New Orleans and Port Eads, 31°; Cedar Keys and Portland, Oreg., 32°. The largest were: Fort Assinniboine, 74°; Eagle Rock and Campo, 69°; Fort Benton, 67°; Prescott, 65°; Winnemucca, 64°; Florence, Ariz., 62°; Forts Shaw and Buford, 61°. The daily ranges varied in the different districts as follows: New England, 21° at New Shoreham and Eastport, to 37° at Boston; Middle Atlantic States, 20° at Chincoteague to 28° at Atlantic City, Washington, and Norfolk; South Atlantic States, 19° at Charleston to 28° at Augusta and 29° at Wilmington; Florida Peninsula, 14° at Key West to 19° at Cedar Keys; Eastern Gulf States, 19° at New Orleans to 26° at Montgomery; Western Gulf States, 16° at Galveston to 29° at Mason and 33° at San Antonio; Ohio Valley and Tennessee, 24° at Cincinnati to 28° at Morgantown and Memphis, and 30° at Pittsburgh; Lower Lake region, 24° at Sandusky to 29° at Buffalo and 38° at Rochester; Upper Lake region, 23° at Escanaba to 31° at Duluth and 33° at Port Huron; Upper Mississippi Valley, 21° at La Crosse to 29° at Saint Paul and 30° at Saint Louis; Upper Missouri Valley, 26° at Omaha to 42° at Yankton and Fort Bennett; extreme Northwest, 37° at Fort Stevenson to 43° at Bismarck; Northern Slope, 27° at Helena to 45° at North Platte and 47° at Deadwood; Middle Slope, 39° at Fort Elliott to 40° at Denver and Dodge City; Southern Slope, 27° at Jacksborough, to 40° at Stockton and 47° at El Paso; Rio Grande Valley, 24° at Edinburgh to 44° at Uvalde; Northern Plateau, 28° at Lewiston to 39° at Boisé City and 50° at Eagle Rock; Middle Plateau, 29° at Pioche to 32° at Salt Lake City and 55° at Winnemucca; Southern Plateau, 42° at Silver City to 44° at Tucson and 51° at Fort Verde, North Pacific coast, 19° at Portland to 27° at Olympia and 28° at Roseburgh; Middle Pacific coast, 19° at San Francisco to 35° at Sacramento and Red Bluff; South Pacific coast, 23° at San Diego to 37° at Visalia, Los Angeles and Yuma, and 60° at Campo.

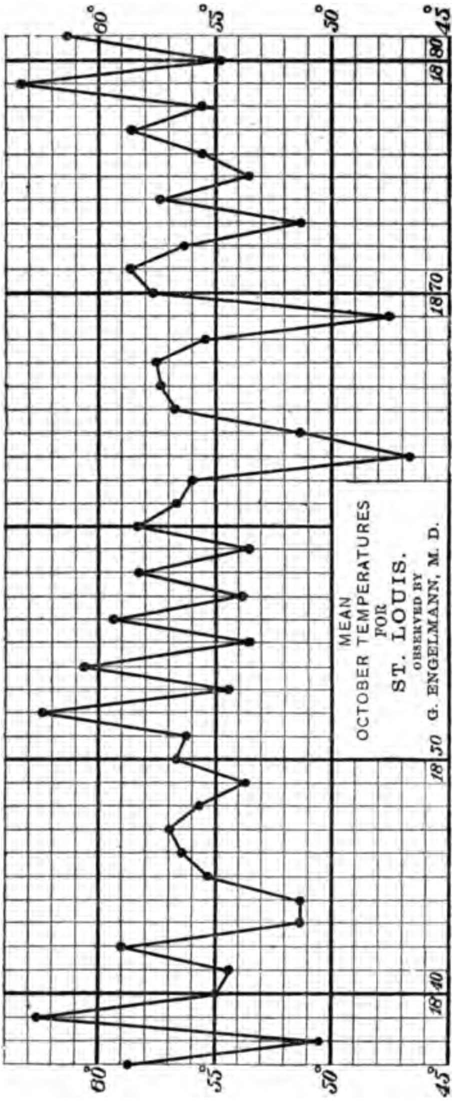
Table of maximum and minimum temperatures for October, 1881.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Montgomery	92	49	Auburn		44
Arizona	Florence and San Carlos.	98				
Do	Prescott		21			
Arkansas	Little Rock	90	44			
California	Campo	89	19	Galt and Fort Yuma	100	
Do				Camp Kellogg		15
Colorado	Denver	82	28	Fort Garland		15
Connecticut	New Haven	86	28	Southington	86	22
Dakota	Fort Sully	77		Fort Hale	81	
Do	Fort Buford		9	Fort Buford		5
Delaware	Delaware Breakwater.	84	49			
District of Columbia	Washington	92	37			
Florida	Key West	91		Houston	95	
Do	Punta Rassa		51	Fort Barrancas		46
Georgia	Augusta	90	48	Forsyth	93	
Do	Atlanta		48	McPherson Barracks		45
Idaho	Eagle Rock	78	9			
Illinois	Cairo	88		Anna	90	
Do	Champaign		39	Elmira		29

Table of maximum and minimum temperatures for October, 1881—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	M'n.	Station.	Max.	Min.
		°	°		°	°
Indiana	Indianapolis	81	39	Laconia	86	35
Do				Vevay	86	
Indian Territory	Fort Supply	90	24			
Iowa	Des Moines	83	32	Des Moines, Fort Madison, & Logan.	86	
Do				Cresco		26
Kansas	Dodge City	89	29	Wellington	95	
Do				Fort Wallace		11
Kentucky	Louisville	87	43			
Louisiana	Shreveport	94	47			
Maine	Portland	83		Cornish and Dexter		22
Do	Eastport		24			
Maryland	Baltimore	89	39	Fallston and Federalsburgh.	90	
Do				Woodstock		28
Massachusetts	Boston	90	28	Heath		20
Michigan	Port Huron	79		Fort Brady		20
Do	Escanaba		25			
Minnesota	Saint Paul	72				
Do	Moorhead		17	Fort Snelling	75	
Mississippi	Vicksburgh	90	45			
Missouri	Saint Louis	85	43	Neosho	95	
Do				Sedalia		29
Montana	Fort Keogh	73		Fort Assinniboine		—17
Do	Fort Assinniboine		—16			
Nebraska	Omaha	85		Clear Creek	89	
Do	North Platte		25			
Nevada	Winnemucca	75	11	Carson City	78	
New Hampshire	Mount Washington	54	—3	Auburn	88	
New Jersey	Sandy Hook	87		Vineland	92	
Do	Atlantic City		35	Acto		27
New Mexico	La Mesilla	92		Fort Union		18
Do	Fort Bayard and Silver City.		30			
New York	New York City	88		West Point	93	
Do	Buffalo		29	Madison Barracks		17
North Carolina	Hatteras and Kittyhawk.	90		Weldon	92	35
Do	Charlotte		42			
Ohio	Cincinnati and Columbus.	84		Jacksonburgh and Portsmouth.	86	
Do	Toledo		35	Westerville		32
Oregon	Umatilla	69	21			
Pennsylvania	Pittsburgh	89	35	Milton	95	
Do				Dyberry		20
Rhode Island	Newport	78	34	Fort Adams	81	31
South Carolina	Charleston	89	54	Aiken		45
Tennessee	Memphis	89				
Do	Nashville	89	43			
Texas	Edinburgh	94				
Do	Fort Elliott		33			
Utah	Salt Lake City	82	25	Coalville		13
Vermont	Burlington	74	25	Woodstock	83	17
Virginia	Cape Henry			Accotink	91	
Do	Norfolk	89		Snowville		
Do	Chincoteague		42			31
Washington Territory	Almota	72				
Do	Dayton		19			
West Virginia	Morgantown	84	36	Flemington	86	29
Wisconsin	Madison	77	33	Edgerton	82	
Do				Neillsville		24
Wyoming	Cheyenne	76	18	Fort Bridger	78	—3

Deviations from mean temperature.—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of Chart No. II. The following items of importance in connection with this subject are reported by voluntary observers: *Illinois:* Riley, mean temperatue 4°.7 above that of past twenty years; October, 1879, was the only month with a higher temperature; the minimum temperature for each October during the past twenty years has been lower than that of the present year and the monthly range for the present month is the smallest for the same period. *Maine:* Gardiner, mean temperature 0°.24 below the average for the past forty-five years. *Maryland:* Fallston, mean temperature considerably above the average for the past ten years. Sandy Springs, warmest October for past fifteen years. *Missouri:* Saint Louis, the Missouri Weather Service reports: mean temperature 5° above the average of the past forty-five years; this mean has been exceeded but three times since 1837; highest, 62°.8, occurred in 1839; lowest, 46°.7, occurred in 1863. *New Hampshire:* Contoocookville, mean temperature 1° above the average for past eleven years. *New York:* Waterburgh, mean temperature considerably above the average for the past ten years; highest mean temperature during this period occurred in 1879. Palermo, mean temperature 0°.4 above the average for the past twenty-eight years. North Volney, mean temperature 2°.6 above the average for past thirteen years; highest monthly mean during that period, 55°.5, occurred in 1879; lowest, 44°.7, occurred in 1876. *West Virginia:* Flemington, mean temperature 8° above the mean for October, 1880. *Virginia:* Wytheville, mean temperature 4°.7 above the average for the past seventeen years.



Frosts.—In the various districts they were reported on the following dates: New England, 3d to 7th, 9th to 12th, 14th, 20th to 22d, 26th to 29th; Middle Atlantic States, 5th, 6th, 7th, 11th, 12th, 14th, 19th to 23d, 26th to 28th; South Atlantic States, 6th, 7th, 9th, 11th, 12th, 21st, 22d, 26th, 27th; East Gulf States, 26th; West Gulf States, 19th, 22d, 27th; Ohio Valley and Tennessee, 5th, 6th, 11th, 14th, 15th, 17th to 23d, 25th to 27th; Lower Lake region, 5th, 6th, 7th, 10th, 11th, 14th, 19th, 20th, 21st, 26th to 28th; Upper Lake region, 1st, 2d, 4th to 6th; 9th to 11th, 13th, 14th, 16th to 28th, 31st; extreme Northwest, 1st to 5th, 8th, 9th, 11th to 27th, 30th; Upper Mississippi Valley, 5th, 9th, 10th, 13th, 16th, 18th to 22d, 24th to 26th; Missouri Valley, 8th, 9th, 13th, 15th to 21st, 23d to 26th, 30th; Northern Slope, 1st, 2d, 4th to 31st; Middle Slope, 16th to 20th, 24th, 25th, 28th, 30th; Southern Slope, 20th, 25th, 30th; Southern Plateau, 11th, 12th, 14th to 18th, 21st to 24th, 28th to 31st; Middle Plateau, 4th to 10th, 12th to 18th, 21st to 31st; Northern Plateau, 1st to 6th, 7th to 10th, 12th to 14th, 22d to 26th; North Pacific region, 1st, 3d, 11th to 14th, 21st, 24th; Middle Pacific region, 13th to 17th; South Pacific region, 3d, 6th to 8th, 14th to 23d, 31st. The following notes in reference to severe and damaging frosts have been reported: Lynchburg, Va., 6th, light frost of this morning was unprepared for; irreparable damage done to the tobacco crop standing in the fields. Southington, Conn., 6th, temperature fell to 22°; great damage done the cabbage crop; pears were frozen on the trees; the change came so suddenly that no preparation was made for it. Westborough, Mass., 5th, great destruction of vegetables and flowers. Worcester, Mass., 5th, vegetation killed. Thornville, Mich., 11th, destructive to vegetation. Johnsonton, Va., 6th, vines killed. Newport, Vt., 5th, apples frozen on the trees; great destruction of fall feed and late crops. Derby Line, Vt., 5th, ground frozen hard; much injury to grapes and other fruit. Stowe, Vt., 5th, all fruit frozen on the trees. Orleans County, Vt., 5th, many large orchards nearly ruined; large loss in apples and vegetables. Lemoore, Cal., 21st, during past week very severe frosts; fig trees, oleanders, and even chrysanthemums were badly damaged; a great many house-plants were killed. Little Metis, Province of Quebec, 28th, grain and potatoes suffered severely. Winthrop, Mass, 6th, immense damage to crops in surrounding country; grapes completely destroyed and apples nearly so; the damage in the county to apples alone is estimated at $25,000; late corn, pumpkins and squash were badly injured. Raleigh, N. C., 6th, tobacco crop in this section badly injured. Plummersville, N. C., 6th, very heavy; much injury to crops. Bristol, Tenn., 22d, first of season; fences perfectly white for miles about; considerable injury to fruit and other crops. Danville, Va., 6th, tobacco severely injured. Richmond, Va., 6th, very general throughout the State, and doing incalculable damage, especially to the tobacco crop; at least one-half of the standing crop has been destroyed; in some portions of the State the condition is even worse; one farmer is reported to have lost 80,000 plants, while the joint loss of two others is estimated at what would fill sixty barns. South Carolina, 6th, in northern portions of State the late growth of cotton has been destroyed. Milford, N. H., 5th, squashes, grapes, and vegetables badly damaged; ground frozen. East Northwood, N. H., 5th, crops and fruit severely injured. Hanover, N. H., 5th, first of the season; ground frozen so hard that the crust would bear up a horse; late fruit severely injured. Portsmouth, N. H., 5th, great damage to fruits and gardens; Warner, N. H., 5th, fruit frozen on the trees and house plants were frozen in-doors. Contoocook, N. H., 5th, fruit, squashes, and other crops badly damaged. Plymouth, N. H., 5th, ground in some places frozen to a thick crust; fruit and vegetables injured. Wolfborough, 5th, most extreme and sudden change of weather ever known here; thermometer fell from 80° Monday noon to 28° Tuesday night; ground was frozen, and throughout this region, grapes, squashes, pumpkins, plants, and vines were severely damaged.

Table of comparative maximum temperatures for the month of October.

State or Territory.	Maximum for October, 1881, Signal Service.		Highest since Signal Service stations were opened—3 to 10 years.			Highest from any other source.		
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Length of record.
		°		°			°	*Years.*
Alabama	Montgomery	92	Mobile	90	1879	Mount Vernon Arsenal	96	31
Arizona	Florence and San Carlos	98	Stanwix	103	1876	Fort McDowell	108	14
Arkansas	Little Rock	90	Little Rock	89	1879	Fort Smith	91	21
						Little Rock	90	37
California	Campo	89	Los Angeles	96	1879	Fort Yuma	105	30
Colorado	Denver	82	Denver	85	'76,'77	Fort Lyon	92	19
Connecticut	New Haven	86	New Haven and New London.	83	1879	Columbia	88	9
						New Haven	83	87
						Fort Trumbull	77	47
Dakota	Fort Sully	77	Fort Buford	95	1879	Fort Buford	96	8
Delaware	Delaware Breakwater	84	Delaware Breakwater	78	1880	Fort Delaware	88	44
District of Columbia	Washington	92	Washington	92	1879	Washington	90	48
Florida	Key West	91	Key West	91	'75-'77	Fort King	99	10
Georgia	Augusta	90	Augusta	89	1879	Augusta Arsenal	92	48
Idaho	Eagle Rock	78	Boisé City	85	'79,'80	Fort Boisé	95	16
Illinois	Cairo	88	Springfield	88	1879	Chicago	90	47
						Manchester	90	10
Indiana	Indianapolis	81	Indianapolis	86	1879	Vevay	96	15
Indian Territory	Fort Supply	90	Fort Sill	91	1878	Fort Sill	96	10
						Fort Gibson	95	52
Iowa	Des Moines	83	Keokuk	87	1879	Muscatine	87	26
Kansas	Dodge City	89	Leavenworth	89	1874	Fort Larned	98	14
						Fort Leavenworth	94	49
Kentucky	Louisville	87	Louisville	88	1879	Chilesburgh	88	3
						Newport Barracks	85	28
Louisiana	Shreveport	94	Shreveport	90	1878	New Orleans	96	50
Maine	Portland	83	Portland	83	1879	Brunswick	88	52
Maryland	Baltimore	89	Baltimore	89	1879	Fort Washington	92	37
Massachusetts	Boston	90	Boston	88	1879	Topsfield	87	8
Michigan	Port Huron	79	Marquette	87	1879	Monroe	89	10
						Ontonagon	89	11
Minnesota	Saint Paul	72	Breckenridge	89	1879	Fort Snelling	90	60
Mississippi	Vicksburgh	90	Vicksburgh	91	1879	Vicksburgh	90	4
						Columbus	89	9
Missouri	Saint Louis	85	Saint Louis	90	1879	Allentown	100	3
Montana	Fort Keogh	73	Fort Custer	87	1879	Fort Shaw	91	7
Nebraska	Omaha	85	North Platte	89	1879	Fort McPherson	102	14
Nevada	Winnemucca	75	Winnemucca	84	1879	Fort Ruby	101	5

New Hampshire	Mount Washington	54	Mount Washington	57	'77,'79	Concord	80	7
						Fort Constitution	79	33
New Jersey	Sandy Hook	87	Sandy Hook	89	1879	Newark	83	9
New Mexico	La Mesilla	92	La Mesilla	96	1879	Fort Cummings	106	4
New York	New York City	88	New York City	88	1879	Poughkeepsie	95	20
North Carolina	Hatteras & Kittyhawk	90	Portsmouth	89	1879	Fort Johnson	90	54
Ohio	Cincinnati & Columbus	84	Toledo	88	1877	College Hill	90	56
						Marietta	88	53
Oregon	Umatilla	69	Umatilla	86	1880	Fort Dalles	100	16
Pennsylvania	Pittsburgh	89	Pittsburgh	91	1879	Mount Joy	90	9
						Philadelphia	88	112
						Carlisle Barracks	89	34
Rhode Island	Newport	78	Newport	81	1879	Providence	85	35
South Carolina	Charleston	89	Charleston	87	1879	Charleston	89	104
						Fort Moultrie	88	27
Tennessee	Memphis and Nashville	89	Knoxville	96	1879	Glenwood Cottage	88	10
Texas	Edinburgh	94	Rio Grande and Uvalde	105	1877	Fort McIntosh	104	25
Utah	Salt Lake City	82	Salt Lake City	83	1876	Fort Douglas	99	18
Vermont	Burlington	74	Burlington	78	1879	Lunenburgh	83	8
Virginia	Cape Henry and Norfolk	89	Fort Whipple	90	1879	Fortress Monroe	89	54
Washington Territory	Almota	72	Dayton	92	1880	Fort Walla Walla	88	10
West Virginia	Morgantown	84	Morgantown	85	1879	Helvetia	86	4
Wisconsin	Madison	77	La Crosse and Madison	84	1879	Fort Crawford	86	25
						Fort Howard	84	30
Wyoming	Cheyenne	76	Cheyenne	80	'74,'79	Fort Laramie	90	26

Ice.—The following stations report its formation: Princeton, Oakland, and Alameda, Cal., 14th. Roseburgh, Oreg., 14th. Boisé City, Idaho, 7th, ⅛ inch; 13th. Prescott, Ariz., 15th, 17th to 20th, 22d, 30th. Deadwood, Dak., 14th, ¼ inch; 15th, ¾ inch; 16th, 17th. Cheyenne, Wyo., 12th, 13th, 14th. Fort Buford, Dak., 4th. Huron, Dak., 12th. Yankton, Dak., 12th, 13th. Saint Paul., Minn., 5th. Duluth, Minn., 13th. Oswego, 5th. Flushing and Port Jervis, N. Y., 5th. Poughkeepsie, N. Y., 5th, ½ inch. Ardenia, N. Y., 5th, 6th, ⅛ inch. Buffalo, 5th. Rochester, 27th. Bangor, Me., 5th, on quiet pools from 2 to 3 inches; 26th. Wood's Holl, Mass., 5th. Thatcher's Island, Mass., 2d. Cambridge, Mass., 10th, 11th, 26th, 27th. Rowe, Mass., 5th, ¼ to ½ inch; 6th, 11th. Springfield, Mass., 5th, 6th. New London, 5th, 6th. Boston, 27th. Burlington, Vt., 14th, 26th. New Haven, 5th. Wabash, Ind., 5th. Nora Springs, Iowa, 20th. Clay Centre, Kans., 18th, ⅛ inch. Orono, Me., 5th, ¼ inch. Dexter, Me., 5th. Fallston, Md., 6th, thin film. Litchfield, Mich., 19th. Niles, Mich., 19th. Thornville, Mich., 24th. Clear Creek, Nebr., 13th, 20th. Genoa, Nebr., 13th, 18th, 24th. Howard, Nebr., 18th, ¼ inch. Grafton, N. H., 5th, ½ inch. Contoocookville, N. H., 5th, ½ inch. Ruggles, Ohio, 11th. Charlotte, Vt., 5th, 27th. Accotink, Va., 6th. Johnsonville, Va., 6th. Derby Line, Vt., 5th, ¼ inch. Newport, Vt., 5th, ½ inch. Stowe, Vt., 5th, ¼ to ½ inch. Milford, N. H., 5th, ¾ inch. Warner, N. H., 5th, ½ inch. Plymouth, N. H., 5th, ¼ to ½ inch. Bradford, Pa., 5th, 1 inch. London, Province of Ontario, 5th, ¼ inch. British Columbia, 14th; cold weather has been very severe for several days; ice formed every night.

PRECIPITATION.

The general distribution of rainfall for the month of October, 1881, is shown on Chart No. III from the reports of over five hundred stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records (covering a period of many years) of Signal Service stations, and also a comparison of the present month with such averages. Upon examining the chart a decided excess in the monthly rainfall is found to prevail over the central portion of the country, the departures ranging from 0.22 inch in the Eastern Gulf States to 4.52 inches in the Upper Mississippi Valley. The area of deficiency is confined to the Atlantic coast, and except a slight excess in the Middle Atlantic States prevails from the Canadian maritime provinces southwestward to include Florida, the departures ranging from 0.90 inch in New England to 4.00 inches in the Florida Peninsula. On Mount Washington there appears to be a very large excess, the total monthly rainfall measuring 18.38 inches. On the Pacific coast a comparison with the average shows a range of from normal in the South Pacific region to +1.68 inches in the North Pacific region. As a means of interesting comparison the following maximum departures from the average are given for each year since 1872, together with the corresponding districts: 1873, large excess, New England and Middle Atlantic States; 1874, —3.85 inches, Western Gulf States, and —3.10 inches, New England; 1875, —1.40 inches, Lower Missouri Valley and Middle Atlantic States, and +1.30 inches, North Pacific region; 1876, +5.15 inches, South Atlantic States, and —2.35 inches, New England; 1877, +5.88 inches, Western Gulf States; 1878, +2.35 inches, Minnesota; 1879, +3.18 inches, Eastern Gulf States; 1880, +3.36 inches, Florida Peninsula.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rainfall in the lower left-hand corner of Chart No. III. The following items of importance in connection with this subject are reported by voluntary observers: *Connecticut:* Southington, monthly rainfall considerably below the average for the past eleven years. *Indiana:* Wabash, monthly rainfall double the average of several years past. *Illinois:* Riley, monthly rainfall 4.53 inches above the average for the past twenty years, and 0.24 inch greater than the largest rainfall during that period. *Maine:* Gardiner, monthly rainfall 1.90 below the average for the past forty-five years. *Missouri:* Saint Louis, Missouri Weather Service reports monthly rainfall considerably above the average for the past forty-five years. *New Hampshire:* Contoocookville, monthly rainfall about 1.50 inches below the October average for the past eleven years. *New York:* Palermo, monthly rainfall equals the normal or the average of the past twenty-eight years; North Volney, monthly rainfall 0.12 above the average of the past nine years. *West Virginia:* Flemington, monthly rainfall considerably less than the average and 1.00 inch less than that of October, 1880.

Special heavy rains.—1st, Mount Ida, Ark., 2.00 inches in 6 hours and 50 minutes; Franklin, Ark., 3.48: Denison, Tex., 2.82; Eagle Pass, Tex., 3.18; Lexington, Mo., 3.83; Fort Smith, Ark., 3.75. 1st and 2d, Pierce City, Mo., 4.50; Brackettville, Tex., 13.08, of which 10.97 fell in eight hours. 2d, Blooming Grove, Pa., 2.90; Toledo, 3.10 in 12 hours; Fort Scott, Kans., 1.80 in 20 minutes. 2d and 3d, Springfield, Ill., 5.74. 4th, Vevay, Ind., 1.20 in 40 minutes. 4th and 5th, Yates Centre, Kans., 2.40 during late night and early morning. 6th, Swanwick, Ill., 2.25 in 1 hour and 45 minutes. 6th and 7th, Manitowoc, Wis., 3.30. 8th, Laredo, Tex., 3.53. 9th, Anna, Ill., 3.20; Fort Davis, Tex., 2.82. 11th, Northfield, Minn., 2.84. 11th and 12th, Neillsville, Wis., 3.20. 12th, Saint Joseph, Mo., 3.63. 15th, Mount Washington, 2.87. 16th and 17th, Nora Springs, Iowa, 3.00. 17th, Charleston, Ill., 2.50; Grand Haven, 3.04; Saint Joseph, Mo., 3.60. 18th, Eastport, Me., 2.76. 20th and 21st, Mayport, Fla., 3.41. 23d, Pensacola, Fla., 2.65; Galveston, 2.96. 24th and 25th, Brownsville, Tex., 3.35. 27th, Shreveport, 3.80. 27th and 28th, Vicksburgh, 6.59; Fayette, Miss., 6.20. 28th, Charleston, Ill., 2.50. 29th and 30th, Highlands, N. C., 8.27. 30th and 31st, Emmittsburg, Md., 3.52.

Largest monthly rainfalls.—Mount Washington, N. H., 18.38 inches; Brackettville, Tex., 16.17; New Ulm, Tex., 12.44; Nora Springs, Iowa, 11.70; Kirksville, Mo., 11.30; Saint Joseph, Mo., 11.24; Highlands, N. C., 10.83; Hannibal, Mo., 10.70; Edinburgh, Tex., 10.54; Galveston, 10.33; Alpena, Mich., 10.25; Northport, Mich., 10.19; Springfield, Ill., 10.02; Vicksburgh, 9.69; Madison, Wis., 9.10; Louisiana, Mo., 8.95; Macon, Mo., 8.88; Manitowoc, Wis., 8.81; Fayette, Miss., 8.80; Emmittsburgh, Md., 8.77; Embarrass, Wis., 8.75; Columbus, Ohio, 8.64: Neillsville, Wis., 8.60; Carthage, Mo., 8.55; Yates Centre, Kans., 8.52; Toledo, 8.49; Fort Smith, Ark., 8.41; Shelbina, Mo., 8.40; Greenfield, Mo., 8.30; Shreveport, 8.28; Olympia, Wash., 8.18; Pierce City, Mo., 8.10; Cresco, Iowa, 8.06; Keokuk, 8.01; Geneseo, Ill., 7.90; Grand Haven 7.87; Neosho, Mo., 7.68; La Crosse, 7.56; Litchfield, Mich., and Mount Ida, Ark., 7.45; Niles, Mich., 7.41; Bolivar, Mo., and Coldwater, Mich., 7.40; Buffalo, 7.33; New Corydon, Ind., 7.31; Charleston, Ill., and O'Fallon, Mo., 7.30; Little Mountain, Ohio, Monticello, Iowa, and Saint Louis, 7.21; Vevay, Ind., 7.20; Battle Creek, Mich., 7.17; Fort Brown, Tex., 7.04; Muscatine, Iowa, 7.03; Albany, Oreg., 7.00.

Smallest monthly rainfalls.—Wilcox, Ariz., Chico and Pajaro, Cal., Browns, Reno, and Wells, Nev., and Kelton, Utah, none; Casa Grande and Yuma, Ariz., and Mojave, Cal., trace; Byron, Cal., 0.04 inch; Stockton, Cal., 0.05; Solidad, Cal., 0.07; Hot Springs, Nev., 0.08; Wickenburgh, Ariz., 0.09; Camp Kellogg, Sumner, and Tehachapi, Cal., Fort Lincoln, Dak., and Boca, Nev., 0.10; Tracy, Cal., 0.15; Carson City, Nev., 0.17; Humboldt, Nev., 0.18; Benicia Barracks and Goshen, Cal., 0.19; Fort Verde, Ariz., and Hollister, Cal., 0.20; Keene, Cal., 0.21; Tulare, Cal., 0.22; San Diego, Cal., 0.24; Modesto and Oakland, Cal., Flemington, N. J., and Phœnix, Ariz., 0.25; Mammoth Tank, Cal., 0.26; Davis and Salinas City, Cal., and Fort Brooke, Tampa, Fla., 0.28; Visalia, Cal., 0.31; Denver, 0.32; Prescott, Ariz., 0.33; Borden, Cal., and Benson, Ariz., 0.34; Merced and Spadra, Cal., and Fort Wallace, Kans., 0.35; Fresno, Menlo Park, and Point San José, Cal., 0.36; Woodland, Cal., 0.37; Dunnigan and Niles, Cal., 0.38; Fort Buford, Dak., and Galt, Cal., 0.39; South Vallejo, Cal., and Toano, Nev., 0.40; Rio Vista, Cal., 0.41; Farmington, Cal., 0.44; Brighton, Cal., 0.45; Fort Keogh, Mont., and Gilroy, Cal., 0.46; Willows, Cal., 0.47; Carlin, Nev., and Terrace, Utah, 0.48; Ione, Cal., and Coalville, Utah, 0.50.

Rainy days.—The number varied in New England from 10 to 22; Middle Atlantic States, 7 to 17; South Atlantic States, 7 to 17; Florida Peninsula, 7 to 17; East Gulf States, 8 to 15; West Gulf States, 11 to 21; Rio Grande Valley, 6 to 19; Ohio Valley and Tennessee, 7 to 20; Lower Lake region, 18 to 21; Upper Lake region, 14 to 20; extreme Northwest, 7 to 14; Upper Mississippi Valley, 9 to 20; Missouri Valley, 8 to 16; Northern Slope, 5 to 13; Middle Slope, 3 to 12; Southern Slope, 6 to 13; Southern Plateau, 4 to 10; Middle Plateau, 4 to 9; Northern Plateau, 9 to 17; North Pacific region, 17 to 19; Middle Pacific region, 7 to 8; South Pacific region, 1 to 4.

Cloudy days.—The number varied in New England from 6 to 17; Middle Atlantic States, 4 to 12; South Atlantic States, 5 to 9; Florida Peninsula, 0 to 4; East Gulf States, 6 to 10; West Gulf States, 3 to 14; Rio Grande Valley, 8 to 15; Ohio Valley and Tennessee, 7 to 14; Lower Lake region, 13 to 16; Upper Lake region, 12 to 18; extreme Northwest, 10 to 13; Upper Mississippi Valley, 7 to 16; Missouri Valley, 9 to 15; Northern Slope, 2 to 13; Middle Slope, 6 to 9; Southern Slope, 0 to 9; Southern Plateau, 1 to 4; Middle Plateau, 1 to 6; Northern Plateau, 4 to 19; North Pacific region, 12 to 18; Middle Pacific region, 1 to 3; South Pacific region, 0 to 4.

Snow.—The dates on which snow fell are most numerous in Dakota, Montana, Idaho, and Wyoming Territories, as follows: *Dakota:* 9th, 11th, 12th, 14th, 15th, 18th, 19th, 22d, 23d, 31st. *Montana:* 9th to 19th, 29th to 31st. *Idaho:* 11th to 17th, 31st. *Wyoming:* 12th, 16th, 21st to 23d, 26th, 28th, 31st. In the other States and Territories it was reported from various stations on the following dates: Burlington, Vt., 26th; Eastport, Me., 5th, 26th; Bangor, Me., 5th; Mount Washington, N. H., 5th, 12th, 15th, 18th, 23d to 27th; Portland, Me., 5th; Nashville, Tenn., 25th; Marquette, Mich., 9th, 10th, 14th, 17th, 19th, 25th; Duluth, Minn., 19th; Moorhead, Minn., 14th, 15th; Denver, Colo., 31st; Fort Apache, Ariz., 24th, 26th; Fort Bayard, N. Mex., 27th; Salt Lake City, 14th; Winnemucca, Nev., 11th, 13th, 15th, 20th, 31st; Pioche, Nev., 25th; Colfax, Wash., 11th, 15th; Umatilla, Oreg., 11th; Dayton, Wash., 11th, 12th, Pomeroy, Wash., 10th, 12th; Spangle, Wash., 11th, 15th, 16th, 17th; Olympia, Wash., 11th; Portland, Oreg., 14th; Red Bluff, Cal., 4th; Fort Bidwell, Cal., 3d, 5th, 10th, 13th, 15th, 27th, 29th, 31st; Fort Lewis, Colo., 24th, 26th, 28th, 31st; Pagosa Springs, Colo., 24th, 26th, 31st; Fort Brady, Mich., 9th, 14th, 17th; Fort McDermitt, Nev., 12th, 27th, 30th; Fort Wingate, N. Mex., 24th; Fort Union, N. Mex., 29th, 31st; Plattsmouth Barracks, N. Y., 26th; Fort Douglas, Utah, 13th, 20th, 28th; Franklin, Ark., 24th; Grafton, N. H., 5th; Charlotte, Vt., 26th; Lunenburgh, Vt., 5th, 26th; Woodstock, Vt., 5th; New Tacoma, Wash., 14th; Newport, Vt., 5th; Stowe, Vt., 5th; Lewiston, Me., 5th; Wolborough, N. H., 5th; near Bradford, Pa., 5th; New Brunswick, 18th, in northern part of province fell to the depth of 10 inches; in Victoria and Restigouche Counties, 3 to 5 inches deep. Quebec, 18th, 8 inches fell during the night; Lawrence County, N. Y., 10th, covering the ground. Chico, Cal., 13th; in the mountains first severe snow-storm of the season; 12 inches fell on the Humboldt road; Salt Lake City, 20th, 21st, in moutains; Presque Isle, Me., 18th, fell to the depth of 9 inches.

Hail.—The usual diminution in the number of this class of storms as winter approaches is quite well marked for the month of October. Of the following small number reported few were of any importance as regards severity: Winnemucca, 28th; Pioche, 25th; San Carlos, Ariz., 5th, 2 p. m. until 5.30 p. m., largest hailstones ever seen here; Fort Lewis, Colo., 6th, 24th; Holton, Kans., 14th; Clear Creek, Nebr., 27th; De Soto, Nebr., 16th; Albany, Oreg., 12th; Manitowoc, Wis., 6th.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 70 to 88; Middle Atlantic States, 65 to 82; South Atlantic States, 69 to 81; East Gulf States, 72 to 80; West Gulf States, 73 to 82; Rio Grande Valley, 73 to 86; Ohio Valley and Tennessee, 71 to 80; Lower Lake region, 72 to 78; Upper Lake region, 70 to 82; extreme Northwest, 67 to 75; Upper Mississippi Valley, 69 to 81; Missouri Valley, 73 to 76; Northern Slope, 54 to 79; Middle Slope, 49 to 76; Southern Slope, 57 to 78; Southern Plateau, 30 to 70; Middle Plateau, 38 to 56; Northern Plateau, 59 to 80; North Pacific region, 80 to 83; Middle Pacific region, 59 to 74; South Pacific region, 51 to 70.

WINDS.

The prevailing winds during the month of October, 1881, at Signal Service stations, are shown on Chart No. II, by arrows, which fly with the wind. In the South Atlantic and East Gulf States and in the Florida Peninsula, northeasterly; in the Middle Atlantic States and New England, south to west and northwest; in the Lake region, southeast to southwest; throughout the Mississippi and Ohio Valleys and in Texas, southerly; in the Upper Missouri Valley and the Rocky Mountain regions, northerly; in the Plateau regions and along the Pacific coast, south to west.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 30,501 miles; Delaware Breakwater, 12,222; Portsmouth, N. C., 11,881; Wood's Holl, Mass., 11,463; Cape May, N. J., 11,256; Hatteras, N. C., 11,199; Kittyhawk, N. C., 11,094; Chincoteague, Va., 11,054; New Shoreham, R. I., 11,052; Port Eads, La., 10,358; Thatcher's Island, Mass., 10,176; North Platte, Nebr., 9,839; Dodge City, Kans., 9,824; Indianola, Tex., 9,809; Sandy Hook, N. J., 9,727; Sandusky, Ohio, 9,257; Barnegat, N. J., 9,120; Fort Sill, Ind. T., 9,084; Macon, N. C., 8,898; Cape Henry, Va., 8,659; Galveston, Tex., 8,575; Fort Elliott, Tex., 8,498; Champaign, Ill., 8,263; Moorhead, Minn., 8,052. The smallest are: La Mesilla, N. Mex., 1,217; Lewiston, Idaho, 1,451; Lynchburgh, 1,457; Silver City, N. Mex., 1,470; Uvalde, Tex., 1,743; Florence, Ariz., 1,778; Roseburgh, Oreg., 1,915; Visalia, Cal., 2,285; Yuma, Ariz., 2,400; Laredo, Tex., 2,516; Dayton, Ohio, 2,587; Missoula, Mont., 2,677; Washington, D. C., 2,780; Tucson, Ariz., 2,839; Memphis, Tenn., 2,846.

High winds.—On summit of Mount Washington a maximum velocity of 160 miles, northwest, was recorded on the 16th, and for five minutes the register showed a velocity of 200 miles per hour. These are the highest velocities ever recorded at this station. Velocities of 100 miles per hour, and over, were recorded on the following dates: 5th, 15th, 16th, 26th, 27th. Stations reporting velocities exceeding 50 miles per hour are as follows: Kittyhawk, 60, NE., 5th; Portsmouth, N. C., 56, NE., 5th; Cape Henry, Va., 56, NW., 25th; Bismarck, Dak., 55, NW., 31st; North Platte, Nebr., 54, S., 1st; Delaware Breakwater, 52, N., 5th; and Hatteras, N. C., 52, NE., 5th.

Local storms.—The month of October is quite remarkable for the small number of this class of storms reported. Shawano, Wis., 8th, very violent storm, blowing down trees and fences and unroofing buildings; path of storm about one mile wide; for many miles acres of forest were perfectly leveled, and in many respects the storm's path appeared as if it had been swept by fire. Knox County, Ohio, 2d, terrific wind storm swept over the country during the afternoon, demolishing outbuildings and fences and uprooting trees. Wantonio, Wis., 4th, terrible tornado swept down the valley of Wisconsin River, completely devastating a portion of the country 80 rods wide by about 6 miles in length; houses, barns, outbuildings, and grist-mills demolished. Rochester, N. Y., 17th, 8.30 p. m., tornado with funnel-shaped cloud passed over a small portion of the city, accompanied by a loud roaring noise; trees were uprooted and buildings damaged. Schuyler County, Ill., 8th, terrific tornado, lasting five minutes, and leveling everything in its path; the village of Camden, containing several hundred inhabitants, had every house with the exception of two destroyed; loss to farmers in the vicinity, $15,000. Menominee County, Mich., 8th, tornado passed over the upper waters of the north branch of Pike River, cutting a path through the forest two miles wide and twelve miles in length; hardly a tree was left standing in the path of the storm; it is estimated that 100,000,000 feet of pine were prostrated. Tallahassee, Fla., 28th, tornado passed over the town, unroofing buildings and causing much other damage; a heavy fall of hail accompanied the storm. Cheyenne, 12th, very heavy storm of sleet and wind, prostrating all overland telegraph lines and committing other damage.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for October, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 84.3 per cent. The percentages for the four elements are: Weather, 88.7; Direction of the Wind, 79.2; Temperature, 86.4; Barometer, 82.9 per cent. By geographical districts they are: For New England, 85.1; Middle Atlantic States, 85.5; South Atlantic States, 87.2; Eastern Gulf States, 90.2; Western Gulf States, 87.8; Lower Lake region, 85.6; Upper Lake region, 81.3; Tennessee and the Ohio Valley, 84.2; Upper Mississippi Valley, 80.9; Lower Missouri Valley, 73.9; Northern Pacific Coast region, 91.7; Central Pacific Coast region, 94.7; Southern Pacific Coast region, 100.0. There were 56 omissions to predict (40 being due to the absence of reports from the Pacific coast), out of 3,813, or 1.44 per cent. Of the 3,757 predictions that have been made, 192, or 5.11 per cent., are considered to have entirely failed; 157, or 4.18 per cent., were one-fourth verified; 374, or 9.96 per cent., were one-half verified; 363, or 9.66 per cent., were three-fourths verified; 2,671, or 71.09 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—231 cautionary signals were displayed during the month of October, 1881, of which 178, or 77.05 per cent., were fully justified by winds of 25 miles per hour, or over, at, or within, a radius of 100 miles of the station. Thirty-one off-shore signals were displayed, of which 22, or 70.97 per cent., were fully justified; 28, or 90.32 per cent., were justified as to direction; 22, or 70.97 per cent., were justified as to velocity, and 3, or 9.67 per cent., completely failed. Seven off-shore signals were changed to cautionary. 262 signals of all kinds were displayed, of which 200, or 76.33 per cent., were fully justified. The above does not include signals ordered at display stations, where the velocity is only estimated. Seventy-four winds, of 25 miles, or over, were reported, for which no signals were ordered. Fifty-one signals were ordered late.

NAVIGATION.

Stage of waters in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water, as observed at Signal Service stations during the month of October, 1881. The Red, Arkansas, and Missouri Rivers have remained at a moderate stage throughout the month, except that the latter at Yankton was extremely low. The Ohio, Cumberland, Tennessee, Monongahela, Savannah, and Sacramento Rivers were extremely low, particularly the first and last named. In the Mississippi a marked contrast with other large rivers appears; a very heavy rise began the second week of the month, resulting in a flood about the fourth week, which assumed very serious proportions, causing an immense loss of property between Saint Paul and Saint Louis.

Floods.—*Illinois:* Quincy, 20th, river 18 feet above low-water mark and rising rapidly; water 8 inches higher than the great flood of last spring; all railroads submerged and travel suspended on the Missouri side of the river; bottoms flooded back to the bluffs; river below city fully nine miles wide. 28th, river highest since 1851; nothing can now prevent a complete inundation. Farms for a distance of 25 miles along the bottoms on the Missouri side of the river were abandoned, perhaps never to be reclaimed; everything perishable has been destroyed; no such terrible destruction and destitution ever before experienced in the history of this section. Springfield, 5th, rainfall for past five days measured 9.96 inches, heaviest ever known; rivers converted into raging torrents and small streams into large rivers; very serious washouts on railroads; travel generally suspended. Warsaw, 22d, 35,000 acres of land submerged by the breaks in the Warsaw and Indian Grove levees; the damage to railroads, live stock, and farming property make this flood the most disastrous that has ever occurred in this section; 29th, the damage to property along the Mississippi between Keokuk and Louisiana, Mo., is estimated at $2,930,000; several days will elapse before business can be resumed at the river towns. Carlinville, 14th, hay and corn rotting in the fields; hundreds of acres under water; all streams overflowed; most disastrous flood for years. Galena, 21st, one of the principal thoroughfares of the city under water from one end to the other; city hall and market-house, custom-house and post-office, surrounded; all railroad tracks under water and travel generally suspended. Rockport, 22d, although situated four miles from the Mississippi, a serious flood is imminent; people fleeing to places of safety; roads leading outward from the bottoms crowded with teams hurrying away with goods; hundreds of animals driven away from the flooded region. Moline, 12th, work suspended in mills; 27th, cornfields in vicinity all under water and crop will prove a total loss. Rock Island, 14th, many cellars and streets flooded in upper part of town; 17th, lower part of town flooded; families moving to escape danger; 21st, the entire lower portion of the town flooded. *Iowa:* Burlington, 24th, river reached the high-water mark of 1880; width said to be seven miles; hay stacked along the lowlands on the Illinois side is a total loss. 27th, river seven inches above the flood-tide of 1880. 31st, river continued to rise. Davenport, 12th, water so high at mouth of Rock River that nearly the whole of Big Island was submerged; cornfields in vicinity flooded and operations suspended in mills; trains stopped on Chicago, Milwaukee and Saint Paul Railroad on account of high water; much *débris*, fences, and remains of woodyards passing. 15th, river continued to rise; all trains for Rock Island stopped; men are kept watching and strengthening the dike, which threatens to give way. 19th, river rose two inches; street-car tracks in some localities under water. 20th, river continued to rise; all of the wood sidewalks afloat; streets impassable. 21st, river rising; the Davenport division of the Chicago, Milwaukee and Saint Paul Railroad Company moved their engines out of the round-house and stored them in the round-house of the Chicago, Rock Island and Pacific Railroad Company, for safety from damage by flood; water stopped the Holly engine at the water-works. 22d, river reached the sidewalk on First avenue, and stretched from there to Iowa street in an unbroken waste of water; cars on the Peoria and Rock Island Railroad stood out 200 feet in the river, all tracks submerged, cellars, warehouses, basements, and stores badly flooded, causing great loss; work in all industrial establishments has been suspended; 23d, river rising; first floors of all buildings from Iowa to Rock Island streets flooded; 24th, river rising slowly; 27th, river stationary; the steamer Jennie Gilchrist, after passing through the draw of the Government bridge, was swung around by the fierce current and thrown violently against the latter, causing a total wreck; 28th, river commenced falling slowly. Dubuque, 8th, work suspended in mills on account of high water; flats overflooded; island covered; cellars filled; over 200 men thrown out of employment; 10th, river two miles wide; thirty houses on flats submerged to second stories; a number of families living on the low lands of East Dubuque were compelled to abandon their homes; mills and factories compelled to suspend operations; 11th, river rising slowly; 21st, river 21 feet above low-water mark and but 18 inches below the highest water ever known; railroad tracks and warehouses flooded; reports from interior of State show that in over one-fourth of northern Iowa the hay crop is entirely ruined; entire farms for scores of miles completely under water; the flax crop is ruined. Keokuk, 2d, considerable damage to the Keokuk and Saint Louis Railroad, seven miles below station; river rising rapidly; 4th, bridges carried away on the Keokuk and Saint Louis Railroad; 9th, river rising slowly; 13th, river reached danger-line this morning; railroad tracks under water; 14th, several mills and factories suspended business; 17th, river still rising rapidly; Des Moines River very high, breaking the Egyptian levee near Buena Vista; 29th, low lands for miles entirely under water; canal closed and steamers pass over the rapids; from the large bridge to Hamilton one unbroken sheet of water covered with *débris* of every nature; water within 15 inches of the high-water mark of 1851. Clayton, 11th, river rose over 6 inches in past twenty-four hours; largest rise ever experienced for this season of the year; considerable loss to property. Guttenburg, 30th, no farm work can be done on account of wet weather; during a period of thirty years the river at this point has not been as high at this season of the year, and never during that time has the damage to the corn crop been so great; large quantities of hay have been floated off by the high water. Muscatine, 28th, river reached its highest point (17 feet 8 inches above low-water mark), it being the highest ever known, and one-half inch higher than the June rise of 1880. Clinton, 26th, river rose 19 feet 10 inches, which was only 11 inches below extreme high-water mark; highest water ever known at this season of the year. *Kansas:* Yates Center, 5th, Cedar Creek rose 8 feet, the largest rise for a number of years; 9th, rose 3 feet in twenty minutes; 17th, rose 9 feet in a few hours; stock, corn, and fences were swept away; month remarkable for unusually heavy and frequent rains, it being the wettest October for many years. *Minnesota:* New Ulm, 14th, river overflowed and rising rapidly. Sleepy Eye, 14th, all streams flooded; much damage in surrounding country. Le Sueur, 14th, considerable loss of hay along the bottoms; earth filled with water, rendering almost impossible to travel any distance, even on horseback. Saint Peter, 14th, river rising rapidly; cornfields under water; loss of hay serious. Faribault, 14th, Straight River overflowed, carrying away dams and bridges. Shakopee, 14th, all railroad travel suspended; great quantities of hay washed away; river still rising. Kasota, 7th, river overflowed and the surrounding country flooded; many farm-houses rendered uninhabitable by the water which surrounds them. Mankato, 7th, Minnesota River overflowed for miles, great damage to hay and buildings. Saint Paul, 5th, some of the low lands on both sides of the river near the town partially flooded; large quantities of cord-wood have been carried away; 6th, river rising slowly, causing much alarm to the residents of West Saint Paul; 7th, river rising. *Missouri:* Hannibal, 28th, the break in the Sny Levee 300 yards north of the Hannibal bridge has a width of 200 feet; everything carried away by the rushing torrent; all reclaimed land back of Lewes under water; considerable loss of stock by drowning; aggregate loss from overflow about $500,000. Alexandria, 26th, river one foot above the flood mark of last spring and within two feet and four inches of the great rise of 1851; city almost entirely inundated; people living in the upper stories of their dwellings or leaving the city in skiffs. Clarksville, 21st, river seven inches above the high-water mark of last spring; all people living in the bottoms have been driven from their homes; great suffering from loss of property and the necessaries of life. The following general summary of damage sustained by the country along the central portion of the Mississippi River, although, perhaps, not more than approximating the truth, will be found of interest: Warsaw drainage district, $600,000; Indian Grave district, $750,000; Sny Island district, $1,000,000; Quincy Bay and City, $3,000; Alexandria and vicinity, $250,000; Keokuk and Saint Louis Railroad, $100,000; other railroads, $60,000; open lands north of Sny Levee, $150,000—total, $2,913,000. *New Mexico:* Las Vegas, 6th, great damage on the Atchison, Topeka and Santa Fé Railroad; all traffic south of this point suspended; in the Rio Grande and Gallister Valleys numerous heavy washouts, and in many places road-bed covered with great heaps of sand. *New York:* Buffalo, 2d, one of the heaviest rainfalls that ever occurred in this vicinity; sewers broken, streets badly washed, and many buildings flooded. *North Carolina:* Highlands, 27th to 30th, rainfall 8.57 inches, accompanied by the severest freshet experienced for many years. *Texas:* Grierson Springs, owing to the heavy rains of the latter part of month, the cañon in which the station is situated was flooded for several days, and buildings were in danger of being swept away. Brackettville, 1st, streets flooded; one man was drowned, and many persons narrowly escaped similar fate. Reliable estimates of damage done are as follows: to stores and private dwellings in Brackettville, $7,000, damage sustained by ranchmen in surrounding country, $16,000; two men alone lost 2,326 head of sheep; damage to grading on Mexican Pacific Railroad in Kinney County, $50,000—total, $73,000. In the Pinto and Los Mares Rivers water rose from 3 to 5 feet, doing an immense amount of damage. *Wisconsin:* Stillwater, 4th, river 13 feet and 9 inches above low-water mark; mills shut down; bridges and dams carried away. Warsaw, 4th, most remarkable flood on record; highest water ever known; 8,000,000 feet of logs swept away; roads badly washed, and bridges and lumber piles carried away—total loss in Marathon County alone, over $150,000. Stevens Point, 14th, Black River rose 8 feet in past twenty-four hours; surrounding country flooded; heavy floods reported along Wisconsin River. Galesville, 12th, highest water for many years; all hay along the streams ruined; 14th, roads impassable and all kinds of business seriously embarrassed. Eau Claire, 12th, Chippewa River 7½ feet above low-water mark; 13th, river 14 feet above low-water mark and rising at the rate of 2½ inches per hour; Eau Claire River highest ever known; several buildings undermined and washed out in the river; 40,000,000 feet of logs carried out. Oskosh, 7th, exceedingly heavy rains; serious washouts on the Chicago and Northwestern Railroad, and on the Milwaukee, Lake Shore and Northwestern Railroad; communication generally suspended; country round about badly flooded. Merrill, 4th, river higher than ever known before: all mills shut down; several railroad bridges carried away. Prairie du Chien, 11th, river rising rapidly; all travel suspended on the Chicago, Minneapolis and Saint Paul Railroad, and five miles of track washed out. Waupaca, 14th, vast amount of damage by heavy rains; potatoes lying in the ground by the thousands of bushels, it being too wet to remove them; corn still unhusked and clover seed too wet to thresh. Fond du Lac, 15th, streets impassable and cellars and basements flooded; heavy losses in the country; 18th, roads again flooded; in places stacks of unthreshed grain rotting. Horicon, 15th, thousands of acres overflowed and many highway bridges swept away. Packwaukee, 15th, all bridges between this point and Portage washed away. Fox Lake, 14th, potato crop rotting in the mud, cut hay rotting and floating away; unthreshed grain spoiling and corn sprouting in the fields; impossible to drive over fields, owing to the very soft condition of the soil. Chippewa Falls, 13th, river highest for many years, bridges on all the small streams carried away; roads impassable, trains delayed, and all kinds of work at a standstill. Edson, 14th, entire town flooded, loss of property will reach into the thousands. Milwaukee, 18th, dam in Milwaukee River swept away. La Crosse, 2d, the recent heavy rains have caused the tributaries to the Mississippi in this vicinity to rise to such an extent as to cause alarm. The Black River Valley flooded and a great deal of property destroyed; bridges, dams, etc., have been swept away and much timber lost; farms inundated on both sides of the Mississippi and Black Rivers; 13th, Mississippi River stationary at 12 feet 1 inch above low-water mark; Black River highest ever known for the season; Wisconsin River experienced the highest rise ever known for this season of the year and serious damage was caused; 16th, much damage done to stacked wheat and hay; corn in great quantities was floated away and large fields of potatoes in some places entirely under water.

Drought.—*Connecticut:* New London, 29th, ground parched as if a forest fire had swept over it; streams that have never been known to fail are now reduced to a mere rivulet or dried up altogether; no rain has fallen for many weeks; farmers suffering great distress through the drying up of wells and cisterns. Southington, up to the 30th, drought continued with unabated severity; although rain fell on 13 days the quantities were so small as to be scarcely noticeable; a natural pond in the vicinity has remained dry for more than four weeks, a condition which has not occurred before within the past twenty years. *Maryland:* Fallston, 30th, springs and wells very low; farmers driving stock long distances for water, and in some localities are hauling water for domestic purposes; pasturage very poor. Sandy Springs very dry until 24th; wheat crop seriously injured. *New Jersey:* Paterson, 22d, most serious drought ever experienced; no water has passed over Passaic Falls for the past two months, and for a longer period the mills on the race have been but in partial operation; this is the fourth month of the continued drought; during the months of July, August, September, and October the total rainfall was only 7.83 inches, a deficiency of 8.28, or more than 100 per cent. when compared with the average for those months for the past half century. Since 1830 only one year (1854) has a smaller rain record for those months than the present year. There is no record of the Passaic River being as low as during the prevalence of this drought. Moorestown, the abundant rains of the 30th and 31st close a period of the most terrible drought experienced during the past eighteen years. *Pennsylvania:* Dyberry, drought continued unabated until last of month. Chambersburgh, 28th, dry weather still continues. Milton, 29th, drought still severe; many wells exhausted, some of which were never known to have failed before. Wellsborough, 30th, wells, springs, and streams still very low. *Tennessee:* Ashwood, 30th, the protracted drought of summer continued until the middle of the month. *New York:* Jefferson County, 15th, drought still unabated at Woodville; people hauling water for drinking and culinary purposes. *Rhode Island:* Providence, 15th, the severe drought of the past two months continues unabated; mill streams are so low that only steam power can be used; many reservoirs are exhausted.

Water-spouts.—Off the coast of Cheboygan County, Michigan, and near Mackinac Straits, a large and well-defined water-spout was observed on the 1st by passengers on the steamer Flora; the phenomenon lasted thirty minutes. Barnegat, N. J., 18th, 4 miles below station, moving southeastward across the bay

High tides.—Indianola, 1st, 8th; Norfolk, 5th; New London, 26th; New Haven, 29th.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of Chart No. III. Owing to the breakage of instrument, observations at Charleston, S. C., wanting from the first to 7th.

ATMOSPHERIC ELECTRICITY.

Thunder-storms.—In the various districts they were reported as follows: New England, 3d, 17th, 18th; Middle Atlantic States, 1st, 17th, 18th, 30th, 31st; South Atlantic States, 17th, 18th, 19th, 30th, 31st; East Gulf States, 1st, 16th, 18th, 19th, 23d, 29th, 30th; West Gulf States, 4th, 11th, 15th, 17th, 23d, 26th, 27th, 29th; Rio Grande Valley, 22d, 23d, 26th; Ohio Valley and Tennessee, 2d, 3d, 4th, 8th, 9th, 13th, 15th to 19th, 28th to 30th; Lower Lake region, 2d, 8th, 15th, 17th, 27th; Upper Lake region, 1st, 6th to 8th, 12th, 14th, 15th, 17th, 28th, 29th; extreme Northwest, 10th, 11th; Upper Mississippi Valley, 3d, 4th, 7th, 8th, 11th, 13th to 16th, 19th, 21st, 27th, 28th; Missouri Valley, 1st to 4th, 8th to 18th, 21st to 23d, 27th to 30th; Northern Slope, 10th, 16th; Middle Slope, 8th, 11th, 12th, 14th to 16th, 21st, 22d, 26th, 27th; Southern Slope, 3d, 12th, 13th, 16th to 18th, 22d, 26th; Southern Plateau, 3d to 8th, 12th to 15th, 18th, 21st, 23d, 24th; Middle Plateau, 10th, 25th; Northern Plateau, 6th.

Auroras.—The most general display was that of the night of the 16th and 17th, which was observed from Sidney, N. S., westward to Fort Sisseton, Dakota, and as far south as Freehold, N. J., 17 intervening stations reporting. The display was not a very remarkable one, many of the features usually observed being absent. The display of the 18th was exclusively observed in the Lake region, being reported by the following stations: Marquette, 18th, from 10.10 to 11.15 p. m.; Mission House, Wis., 18th, from 9 to 11 p. m., faintly illumined arch, with dark cloud underneath; Alpena, Mich., 18th, 9.10 p. m., diffuse light without streamers; Toronto, 18th. Other displays were reported as follows: Charlottetown, P. E. I., 20th, 21st, 27th. Fredericton, N. B., 7th, 19th, 27th. Dexter, Me., 19th, faint. Mount Washington, 19th, from 11.22 p. m., to early morning of 20th, faint light. Burlington, Vt., 19th, from 11 to 11.45 p. m., faint; 20th, 11 to 11.30 p. m., faint; 26th, 11 to 11.40 p. m., faint; 27th, 11 to 11.45 p. m. A noteworthy feature of the display of the 27th was its nearness to the horizon; the dark segment was about 2° above the horizon; dancers and streamers were observed, the latter shooting up to a height of 25°; the general color was a faint yellowish light, but that of the dancers was a pale green. Woodstock, Vt., 19th. South Lee, Mass., 29th, p. m. Eastport, Me., 27th, 10 p. m. to midnight; extended from NW. to NE. and to an altitude of 15°; at 11 p. m. numerous beams appeared, all radiating from the same magnetic point, resembling rays of light from the sun, such as are sometimes seen after sunset; their color was a bright yellow. Newport, R. I., 3d, 7 to 9 p. m. Toronto, 20th, 26th. Alpena, 20th, 8.40 p. m.; faint yellow light, with an occasional streamer; ended at 1 a. m. of 21st. Marquette, 20th, 9.50 p. m.; very brilliant at 10.40 p. m., when beams began to shoot up to a height of 30°; the entire northern heavens was illuminated; disappeared at 11.40 p. m. Escanaba, 8th, 9.15 to 9.35 p. m., a few streamers pointing toward zenith; 20th, 10.05 to 11.30 p. m., consisting of beams of pale yellow, having a wavy motion from E. to W. Fort Snelling, Minn., 31st, 5 a. m. Saint Vincent, Minn., 19th, 9 p. m., low down in the north; was bright, sending up many streamers until midnight; 20th, from 8 to 10 p. m., consisting of an arch of about 15° in height, with dark segment; a few streamers and folds; 27th, from 8 to 10 p. m., about 20° in height; was partially obscured. Riley, Ill., 21st, a mere northern twilight; altitude about 12°. Keokuk, 12th, aurora probable; clouds unusually bright in the northern sky from an altitude of 8° to zenith; earth currents interrupted telegraphic communication. New Corydon, Ind,, 19th, 2 a. m., strong auroral light; 22d, 2 a. m., strong auroral light.

Atmospheric electricity interfering with telegraphic communication.—Silver City, N. Mex., 3d; Stockton, Tex., 12th, 16th, 17th.

Zodiacal light.—Monticello, Iowa, 25th; Des Moines, Iowa, 4th; Cambridge, Mass., suspected, 11th, 14th, 26th; Nashville, Tenn., 1st, 2d, 3d. New Corydon, Ind., 20th to 23d, 25th to 27th.

OPTICAL PHENOMENA.

Lunar halos have been observed in the various districts on the following dates: New England, 3d, 5th, 6th, 7th, 28th, 30th, 31st; Middle Atlantic States, 2d, 3d, 6th, 7th, 9th, 12th, 28th; South Atlantic States, 2d, 6th, 7th, 9th, 29th, 30th; East Gulf States, 2d, 7th, 8th; West Gulf States, 2d, 3d, 4th, 10th, 28th to 31st; Rio Grande Valley, 3d, 5th, 6th, 27th; Ohio Valley and Tennessee, 2d, 3d, 7th, 8th, 9th, 11th, 17th, 22d, 27th, 29th, 30th; Lower Lake region, 6th, 7th, 11th, 12th, 28th, 30th, 31st; Upper Lake region, 5th to 11th, 30th, 31st; extreme Northwest, 2d, 9th; Upper Mississippi Valley, 2d, 3d, 6th, 8th, 9th, 29th to 31st; Missouri Valley, 2d, 3d, 4th, 6th, 12th, 29th, 31st; Northern Slope, 6th, 15th, 28th, 30th; Middle Slope, 1st, 6th, 8th; Southern Plateau, 2d, 27th to 30th; Middle Plateau, 6th, 28th; Northern Plateau, 7th, 8th, 31st; North Pacific, region, 14th; Middle Pacific region, 11th, 18th, 28th; South Pacific region, 2d.

Solar halos have been observed in the various districts on the following dates: New England, 2d, 9th, 12th, 19th, 20th, 22d, 23d, 28th, 30th; Middle Atlantic States, 14th, 15th, 16th, 19th, 28th; South Atlantic States, 8th, 23d, 27th; East Gulf States, 1st, 21st, 30th; West Gulf States, 21st, 29th; Ohio Valley and Tennessee, 6th, 7th, 11th, 17th, 19th, 21st to 23d, 27th to 29th; Lower Lake region, 6th, 11th, 17th, 19th, 23d, 27th, 28th, 30th, 31st; Upper Lake region, 11th, 27th; extreme Northwest, 1st; Upper Mississippi Valley, 1st, 5th, 7th, 11th, 20th, 21st; Missouri Valley, 26th; Middle Slope, 6th, 18th, 26th, 30th; Northern Plateau, 8th, 14th, 26th, 27th; Southern Plateau, 25th; Middle Pacific Coast region, 11th, 17th, 30th.

Mirage.—Indianola, 19th, 20th; New Haven, 28th, 7 a. m.

MISCELLANEOUS PHENOMENA.

Earthquakes.—In the mining district of Taversal, Nottinghamshire, England, August, 1881, violent shock in one of the pits of the Stanton Iron Works Company, having a depth of 1,290 feet. The miners were so alarmed at the accompanying noise that they rushed to the mouth of the pit, thinking that an explosion had occurred. In Pear Tree Inn, Fackley, bricks were removed from the chimney; the same thing occurred in a house at Taversal. At the latter village, the station master, while sitting in his house, was thrown from his chair by the shock and a quantity of plastering was detached from the ceiling. There was no explosion in the mines or the occurrence of other ordinary circumstances to account for the phenomenon, but the cause as supposed was clearly indicated by the upheaval of the floor of one of the pits, showing that the seat of the disturbance was below the workings of the mine. This observation would appear to refute the general impression that earthquake shocks are seldom if ever felt at any great depth beneath the surface, as in deep mines. Hawaiian Islands, September 13, 1881, Island of Maui visited by very violent shocks. Constantinople, September, 1881, heavy shocks at Gallipoli and Adrianople during latter part of month. Chaugeri, Province of Anatolia, Turkey, September 30, 1881, heavy shock, 11 persons killed; the grand mosque and many dwellings greatly damaged. The following observations were made on the Island of Ukamok, Alaska Territory (55°, 48′ N., 155°, 34′ W.), by Mr. Alexander Newlander, who resided there during the year ending June 30, 1881: "September 28, 1880, 6 p. m., three very heavy and successive shocks, direction of first shock N. to S., the remaining two from W. to E.; 9 p. m., severe shock from W. to E. 29th, 3 a. m., very heavy shock from W. to E.; 1 p. m., extremely heavy shock from W. to E. From the commencement of this phenomenon, September 28, 1880, until its subsidence October 16, 1880, there was an uninterrupted trembling motion of the earth interspersed with heavy subterranean rumbling sounds. During a short trip over a portion of the island on September 29, deep fissures with a width of from 15 to 20 inches were found to be very numerous. The residence of Mr. Newlander, one story high and substantially built of logs, was situated about 500 yards from shore, on rising ground and about 20 feet above sea level. During the heavy shocks shelves were wrenched from the walls, a brick stove upset, the flooring twisted out of shape and heavy beef and flour barrels (full) were pitched from one side of the room to the other. Outside of the building no one was able to stand on their feet owing to a violent, jerky, and rotary motion of the earth, which continued for at least twenty minutes. The action upon bodies of water is given as follows: Several times at low water the sea rose in a body, traveling inshore about 60 yards, when it would subside, immediately followed by a succession of similar waves. The water in the creeks overflowed their banks to the eastward, as indicated by the condition of the ground on that side, which was dotted by numerous small pools of water, some of which were fully 40 yards distant from the east bank. On the south side of the island a small, shallow creek, across which one could have easily stepped previous to the earthquake, was now widened about six feet; the fresh water was changed to salt water, and the depth so increased that the bottom was not discernible. After the shocks, heavy breakers were observed on the southwest shore of the island, where, for the past four years, no such phenomenon has been observed. On the west side of the island, the tide does not rise as high as before the shocks. The wind during the shocks was invariably from the WNW., and whenever it changed to easterly no shocks were experienced, and the trembling of the earth would diminish considerably." Nickerie, Dutch Guiana, June 20, 1881, 11 a. m., two successive shocks, one immediately following the other, and each lasting about ten seconds; the second was slightly longer in duration and stronger than the first. The shocks were preceded, accompanied, and followed by a dull, rumbling noise, resembling that of distant carriage wheels. The sensations to a person seated in a chair were as if some one was shaking the floor on which the chair stood, by a rapid to-and-fro movement of the arms. A peculiar feeling of nausea was experienced for about a minute after the shocks. The air was very warm and oppressive, and the barometer stood at 30.21, the thermometer at 86°; sea very calm; slight breeze from the east. Bristol, N. H., October 6, 1881, heavy shock little after midnight, direction west to east; noise like the rumbling of a heavy train of cars; buildings jarred preceptibly. Kamouraska, Province of Quebec, 5th, severe shock. Concord, N. H., 6th, heavy shock about midnight; at Tilton it jarred houses and rattled dishes. Ashland, N. H., 6th, slight shock about midnight, lasting a few seconds. Virginia City, Nev., 21st, 7 p. m., two shocks, quite heavy, each lasting about two seconds; direction southwest to northeast. Campo, Cal., 2d, 9 a. m., sharp shock, preceded and accompanied by a heavy, rumbling sound and tremulous vibration, which rapidly increased in severity, shaking buildings and causing crockery to rattle; motion was from SE. to NW.; duration eight to ten seconds. Carson City, Nev., 21st, 6.41 p. m., two slight shocks; motion from S. to N.

Meteors.—Campo, Cal., 30th, 7 p. m., brilliant. Boise City, Idaho, 4th. Pioche, Nev., 13th, 29th. Florence, Ariz., 12th. Little Rock, 21st, very brilliant, moving from W. to S., trail very broad and resembling that of a rocket, flight lasted about eight seconds. Mobile, 18th, 2.20 a. m., appeared in the east about 65° above the horizon, and moved rapidly in a northwesterly direction toward the earth; when about 10° above the horizon it burst with a loud report, throwing off a shower of brilliant fragments, each of which left behind it a bright trail; the entire western sky was illumined by the explosion, which left a cloud that remained visible nearly ten minutes. Pensacola, Fla., 17th, 18th; Southington, Conn., 22d; Morrison, Ill., 18th; Charleston, Ill., 26th; New Corydon, Ind., 7th, 8th, 21st, 22d; Vevay, Ind., visible nearly every night; brilliant on 26th; Monticello, Iowa, 18th; Woodstock, Md., 15th, 16th, 21st; New Bedford, Mass., 17th, 1 a. m.; Thornville, Mich., 26th; Fayette, Miss., 13th to 15th, 17th, 25th, 30th; Oregon, Mo., 19th, 24th, 25th; Atco, N. J., 26th, 27th; Freehold, N. J., 11th, 18th, 20th; Moorestown, N. J., 22d; Ithaca, N. Y., 16th; Elsworth, N. C., 10th; Westerville, Ohio, 10th; Stateburgh, S. C., 9th, 16th, 21st, 27th; Wytheville, Va., 10th. Mr. William J. Fisher, at Saint Paul, Kodiak Island, reports, December 30, 1880, 8.30 p. m., "observed very large meteor, at least 7 feet in length and in circumference about the size of an ordinary barrel. Direction of path, ESE. to WSW.; in shape, conical, the pointed end smooth, while the blunt end (which was in front) had a jagged and corrugated appearance. It emitted a very intense light yellowish color, mingled along the jagged end with a bluish tinge; innumerable bright sparks were thrown off during its flight. The velocity with which it traveled seemed to be about equal to the speed attained by a shell fired from a heavy gun at long range, and the accompanying noise was almost identical with that made by the shell during its flight. The meteor descended into the water near Bliski Island, about fifty yards from shore; when it struck a large volume of water was thrown upon the neighboring land." Winona, Minn., 6th, 8 p. m., very brilliant; exploded like a rocket in a shower of vivid colors and rapidly disappeared.

Annual fog wave of 1881, at New Westminster, B. C., concerning which the following remarks are of interest: Exceedingly heavy rains prevailed from the 16th to the 20th of October, clearing away all the snow of the past winter, except small quantities in the crevices of the mountains. Calm weather now set in, and local fogs began to form along the river, as usual at this time of the year. These fogs lifted each day before 12 m., disclosing a cloudless sky, until the 23d, when the fog remained all day, not lifting before 9 p. m. On the morning of the 24th the fog was very thick along the river, but cleared at noon, with cloudless sky and SSW. wind. On the 25th the fog did not lift until noon, when a little cirro-cumulus, in streaks, could be seen stretching from east to west, with a slight movement from the east. Quite warm at 1 a. m.; temperature, 52°. At 2 p. m. a heavy bank of clouds rose up in the south, with a band of cirrus on its upper edge; barometer falling rapidly. This bank gradually ascended, and at 3.45 p. m. obscured the sun; it now rolled rapidly inland, causing the thermometer to fall some 8° almost instantly, and throwing out an advanced guard of the main body of the fog, distant about one mile to the west. Following this condition the fog gradually thickened, and at 5 p. m. the barometer read 29.708, falling; temperature, 43°, wind, SSW. The following observations were taken during the 25th: 9 a. m., 29.799, 37°, NE.; 3 p. m., 29.748, 47°, SW.; 3.45 p. m., 29.728, 45°, SSW.; 4.10 p. m., 29.718, 44°, SSW.; 5 p. m., 29.708, 43°, SSW.; 9 p. m., 29.683, 42°, calm.

Migration of birds.—Geese flying south: Cheyenne, Wyo., 8th; Deadwood, Dak., 12th; North Platte, Nebr., 9th; Fort Supply, Ind. T., 12th, 13th, in large numbers; Grierson Springs, Tex., 11th, 18th; Stockton, Tex., 1st, 11th, 18th; Coleman, Tex., 12th; Huron, Dak., 4th, 7th, 8th, 20th; Yankton, 8th, 12th, 30th; Saint Louis, 16th; Davenport, 15th, 16th, 17th, 30th; Springfield, Ill., 14th; Cairo, 5th, 6th, 23d, 26th, 27th; Saint Paul, 14th; Little Rock, 5th, 24th; Fort Gibson, 5th, 13th; Indianola, 14th; Milwaukee, 26th; Morgantown, 14th, 18th; Augusta, Ga., 20th; Macon, N. C., 16th; Riley, Ill., 9th; Peoria, Ill., 15th; Fort Wayne, Ind., 16th; Independence, Kans., 9th; Monticello, Iowa, 12th, 13th; Fall River, Mass., 11th; Northport, Mich., 3d, 4th; Oregon, Mo., 3d, 13th; Clear Creek, Nebr., 8th, 12th, 30th; Franklin, Pa., 2d; West Chester, Pa., 7th, 8th; Ashwood, Tenn., 5th; Johnsontown, Va., 14th; Embarrass, Wis., 4th, 10th; Clay Center, Kans., in unusually large numbers. Wood's Holl, Mass., flying west, 12th. Ducks flying south: Stockton, Tex., 11th, 18th; Grierson Springs, Tex., 18th; Saint Paul, 25th, 30th; Little Rock, 5th, 24th; Fort Gibson, 5th, 13th; Indianola, 14th; Augusta, Ga., 2d, 4th; Macon, N. C., 16th; Swanwick, Ill., 14th; Northport, Mich., 3d, 4th; Clear Creek, Nebr., 6th, 19th, 24th. Pigeons flying south: Little Rock, 5th, 24th; Fort Gibson, 10th.

Insects.—*Cotton-worm:* Franklin, Ark., 30th, many fields of cotton entirely stripped of leaves; cotton crop damaged about 70 per cent. Ashwood, Tenn., 15th, appeared in myriads and in a few days devoured all the leaves; after destroying the cotton the worms attacked the wheat crop, doing a vast amount of damage; one farmer lost 100 acres, every blade being eaten to the ground. Clarksville, Tex., 20th, after the rains of the first part of month, the cotton-worm inflicted great damage upon cotton, wheat, and grass. *Hessian fly.*—Ruggles, Ohio, 30th, early wheat severely injured.

Prairie and forest fires.—Fort Stevenson, Dak., 3d, 10th; Salt Lake City, 7th, in mountains; North Platte, Nebr., 1st; Fort Keogh, Mont., 10th; Fort Buford, Dak., 10th;

Moorehead, Minn., 18th to 20th, 22d, 26th; Saint Vincent, Minn., 23d; Fort Stevenson, Dak., 30th; Huron, Dak., 1st, 9th to 11th, 16th, 17th, 19th, 20th, 24th, 27th, 30th, 31st; Yankton, Dak., 18th to 20th, 24th to 26th, 31st; Mason, Tex., 17th.

Polar bands.—Prescott, Ariz., 3d, 30th; New Corydon, Ind., 6th, 7th, 19th, 20th, 27th; Gardiner, Me., 1st; Fayette, Miss., 25th; Clear Creek, Nebr., 21st; Wytheville, Va., 8th, 22d, 27th, 28th.

Sand-storms.—Umatilla, Oreg., 3d; Camp Thomas, Ariz., 20th, 23d, 29th.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 175 stations show 5,387 observations to have been made, of which 32 were reported doubtful; of the remainder 5,355, or 86.2 per cent., were followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, director of the Lawrence Observatory, Amherst, Mass.:

DATE—Oct., 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.
1, 9 a. m.	0	0	0	0	0	0	5	9
3, 4 p. m.	2	25†	1	2	0	0	6	35†*
4, 9 a. m.	0	0	1	5	0	0	5	30†*
5, 2 p. m.	0	0	1	3	0	0	4	20†
6, 10 a. m.	0	5	0	0	0	5	4	25†
7, 4 p. m.	0	0	0	0	0	0	3	25†
8, 3 p. m.	0	0	0	0	0	0	3	20†
10, 1 p. m.	1	3	0	3	1	3	4	20†
11, 1 p. m.	0	0	1	2	0	0	3	18
14, 10 a. m.	1	3	0	0	1	3	4	15
16, 1 p. m.	2	5	1	3	2	5	4	12
19, 1 p. m.	1	2	1	2	1	2	4	15‡
20, 1 p. m.	0	10†	0	0	0	0	4	25†*
21, 10 a. m.	1	20	0	0	1	2	5	45†*
3 p. m.	0	0	0	0	0	0	5	45†
25, 2 p. m.	0	0	....	....	0	0	4	30†
27, 11 a. m.	1	3	1	15†	1	3	4	18‡

Faculæ were seen at the time of every observation.

* Many of the spots small.

† Approximated.

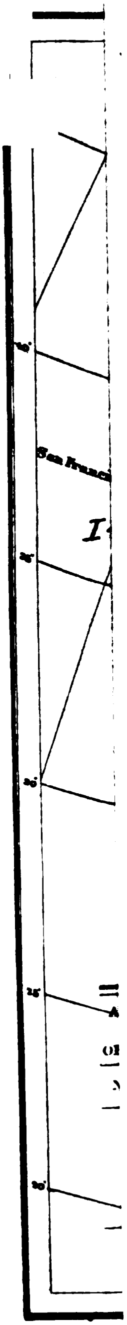
‡ Spots probably disappeared by solar rotation.

Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: Sun spots were observed on every clear day during the month. They were largest and most numerous on the 9th and 21st and least at the close of the month. Mr. David Trowbridge, at Waterburgh, N. Y., reports as follows: 1st, 4 groups, 5 spots; the new group mentioned September 30th has gone out; 1 new group, 2 spots, has appeared by rotation, and a new one has arisen in the east; faculæ. 3d, 5 groups, 9 spots, one group has disappeared by rotation; 3 groups, spots faint, have arisen since the 1st. 4th, 3 groups, 4 spots, 2 groups have gone out. 5th, 4 groups, 6 spots, one new just appearing by rotation. 6th, 4 groups, same as 5th, 5 spots. 8th, 3 groups, 6 spots, one group has disappeared by rotation, one gone out and one arisen. 9th, 3 groups, same as 8th, 10 spots. 11th, 3 groups, 5 spots, one group has disappeared and one appeared by rotation. 14th, 4 groups, 4 spots, a new group has appeared by rotation, faculæ in the east. 16th, 4 groups, 6 spots, two new groups have appeared by rotation and two gone out since the 14th. 20th, 3 groups, 10 spots, several larger. 21st, 3 groups, same as 20th, 7 spots. 22d, 4 groups, 9 spots, one group appears to have broken into two. 23d, 4 groups, same as 22d, 7 spots, cloudiness interfering with observation. 26th, 3 groups, 3 spots; they appear to be the same as some observed on the 23d. 27th, 5 groups, 6 spots, one group appeared by rotation and one has arisen; faculæ in the east and west. 30th, no spots observed, atmosphere somewhat hazy.

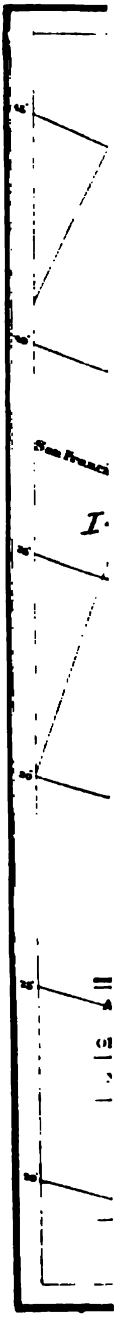
Published by order of the Secretary of War.

W. B. HAZEN.
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

16


40°
San Franci
35°
30°
25°
20°

17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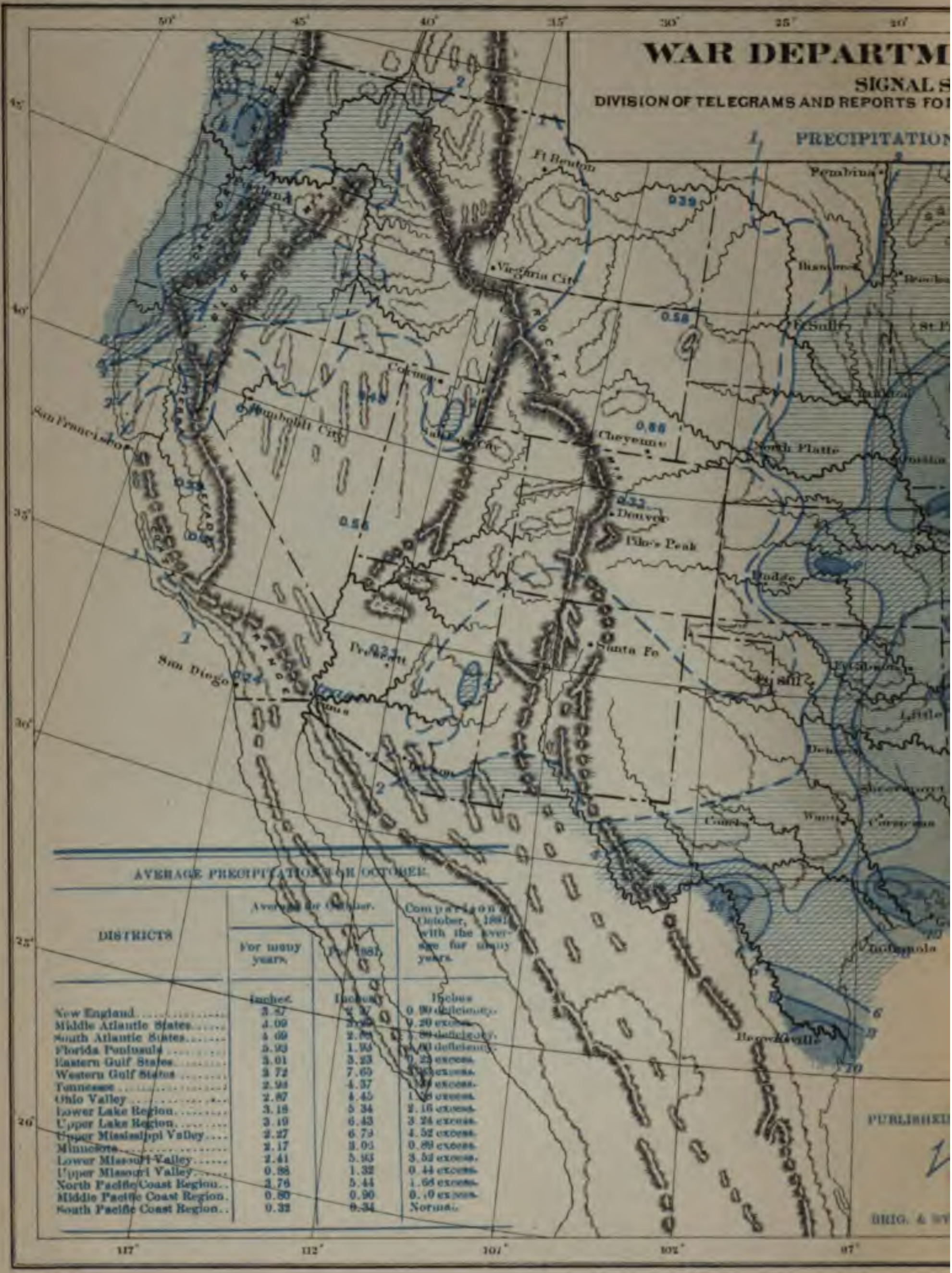
17

18



WAR DEPARTM

SIGNAL S

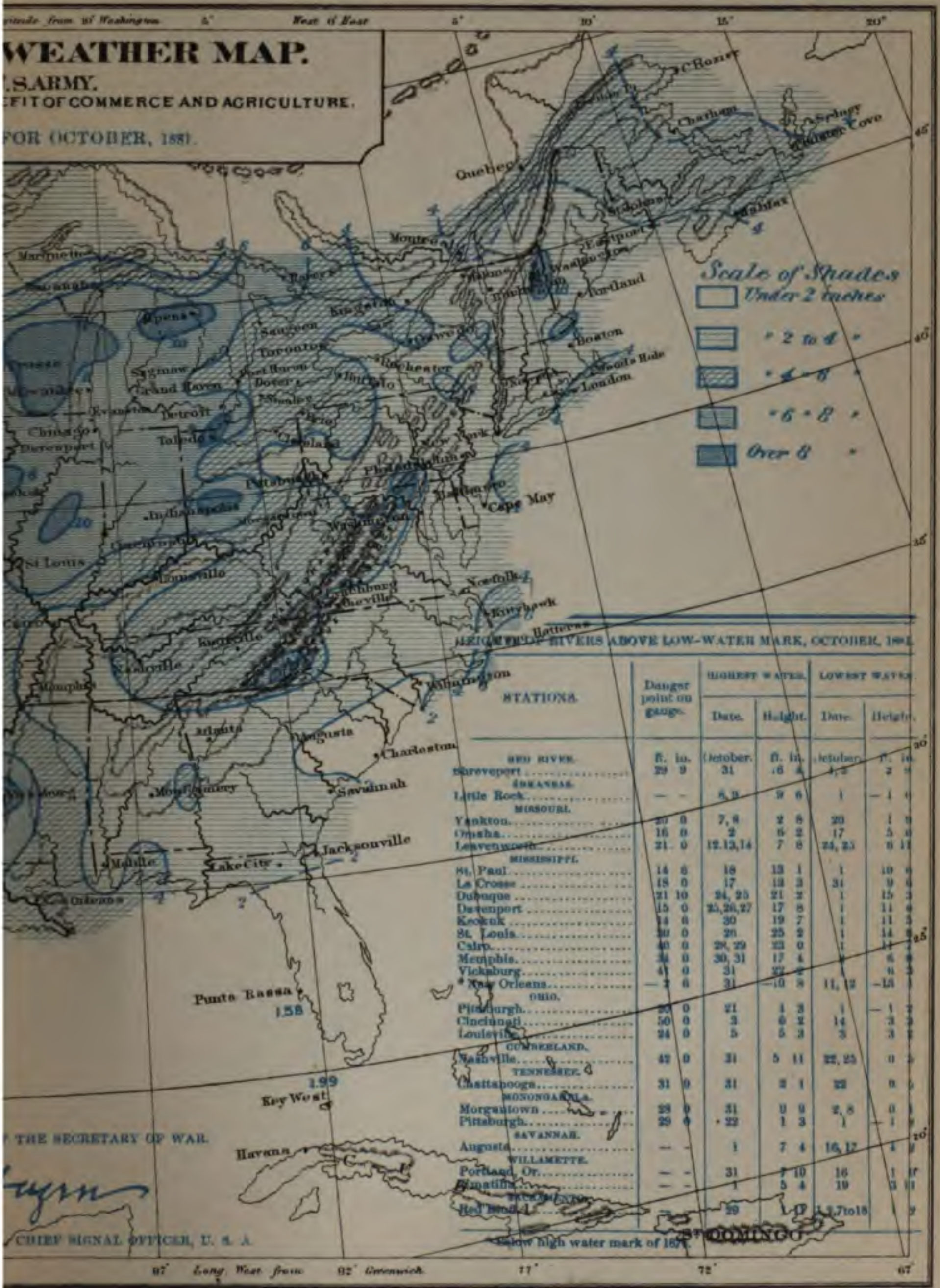
DIVISION OF TELEGRAMS AND REPORTS FO

PRECIPITATION

AVERAGE PRECIPITATION FOR OCTOBER.

DISTRICTS	Average for October.		Comparison of October, 1881, with the average for many years.
	For many years.	For 1881.	
	Inches.	Inches.	Inches.
New England	3.87	2.97	0.90 deficiency.
Middle Atlantic States	4.09	[illegible]	0.20 excess.
South Atlantic States	4.69	[illegible]	[illegible] deficiency.
Florida Peninsula	5.93	1.93	[illegible] deficiency.
Eastern Gulf States	3.01	3.23	0.22 excess.
Western Gulf States	3.72	7.65	[illegible] excess.
Tennessee	2.93	4.37	[illegible] excess.
Ohio Valley	2.87	4.45	1.58 excess.
Lower Lake Region	3.18	5.34	2.16 excess.
Upper Lake Region	3.19	6.43	3.24 excess.
Upper Mississippi Valley	2.27	6.79	4.52 excess.
Minnesota	2.17	3.06	0.89 excess.
Lower Missouri Valley	2.41	5.93	3.52 excess.
Upper Missouri Valley	0.88	1.32	0.44 excess.
North Pacific Coast Region	3.76	5.44	1.68 excess.
Middle Pacific Coast Region	0.80	0.90	0.10 excess.
South Pacific Coast Region	0.32	0.34	Normal.

No. III.



WEATHER MAP.

.S.ARMY.

…FIT OF COMMERCE AND AGRICULTURE.

FOR OCTOBER, 1881.

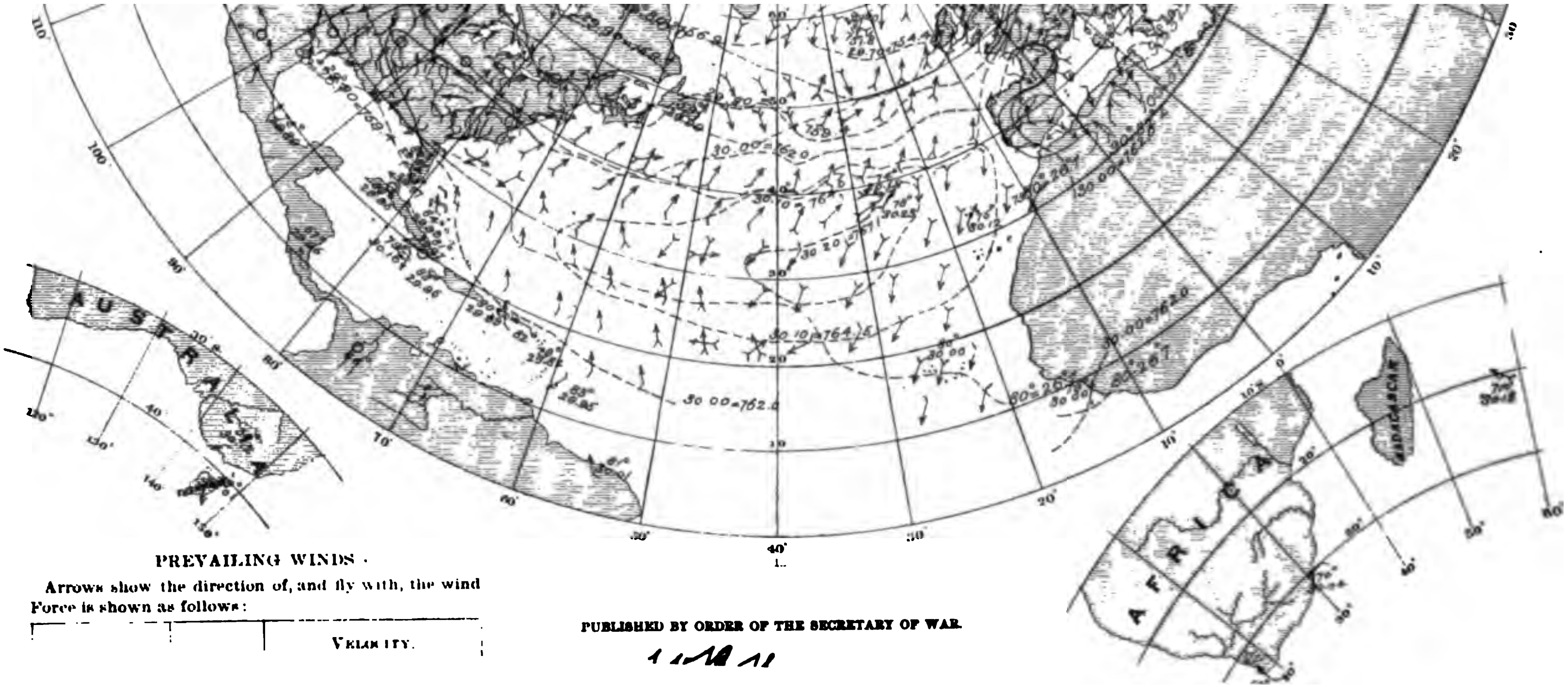
HEIGHT OF RIVERS ABOVE LOW-WATER MARK, OCTOBER, 1881.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER.		
			Date.	Height.		Date.	Height.	
	ft.	in.	October.	ft.	in.	October.	ft.	in.
RED RIVER.								
Shreveport	29	9	31	16	4	4, 5	2	[illegible]
ARKANSAS.								
Little Rock	—	–	8, 9	9	6	1	— 1	[illegible]
MISSOURI.								
Yankton	20	0	7, 8	2	8	20	1	9
Omaha	16	0	2	6	2	17	5	[illegible]
Leavenworth	21	0	12,13,14	7	8	24, 25	6	11
MISSISSIPPI.								
St. Paul	14	6	18	13	1	1	10	[illegible]
La Crosse	18	0	17	13	3	31	9	6
Dubuque	21	10	24, 25	21	2	1	15	3
Davenport	15	0	25,26,27	17	8	1	11	[illegible]
Keokuk	14	6	30	19	7	1	11	5
St. Louis	30	0	28	25	2	1	14	[illegible]
Cairo	40	0	28, 29	23	0	1	14	[illegible]
Memphis	34	0	30, 31	17	4	1	6	[illegible]
Vicksburg	41	0	31	22	[illegible]	1	6	3
* New Orleans	— [illegible]	6	31	—10	8	11, 12	—13	[illegible]
OHIO.								
Pittsburgh	[illegible]	0	21	1	3	1	— 1	[illegible]
Cincinnati	50	0	3	6	2	14	3	[illegible]
Louisville	24	0	5	5	3	3	3	[illegible]
CUMBERLAND.								
Nashville	42	0	31	5	11	22, 23	0	[illegible]
TENNESSEE.								
Chattanooga	31	0	31	2	1	22	0	[illegible]
MONONGAHELA.								
Morgantown	28	0	31	0	9	2, 8	0	[illegible]
Pittsburgh	29	0	* 22	1	3	1	— 1	[illegible]
SAVANNAH.								
Augusta	—	–	1	7	4	16, 17	4	[illegible]
WILLAMETTE.								
Portland, Or.	—	–	31	7	10	16	1	[illegible]
Umatilla	—	–	1	5	4	19	3	[illegible]
SACRAMENTO.								
Red Bluff	—	[illegible]	29	1	[illegible]	1,3,7to18	1	[illegible]

* Below high water mark of 187[illegible].

…THE SECRETARY OF WAR.

CHIEF SIGNAL OFFICER, U. S. A.



PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind
Force is shown as follows:

VELOCITY.

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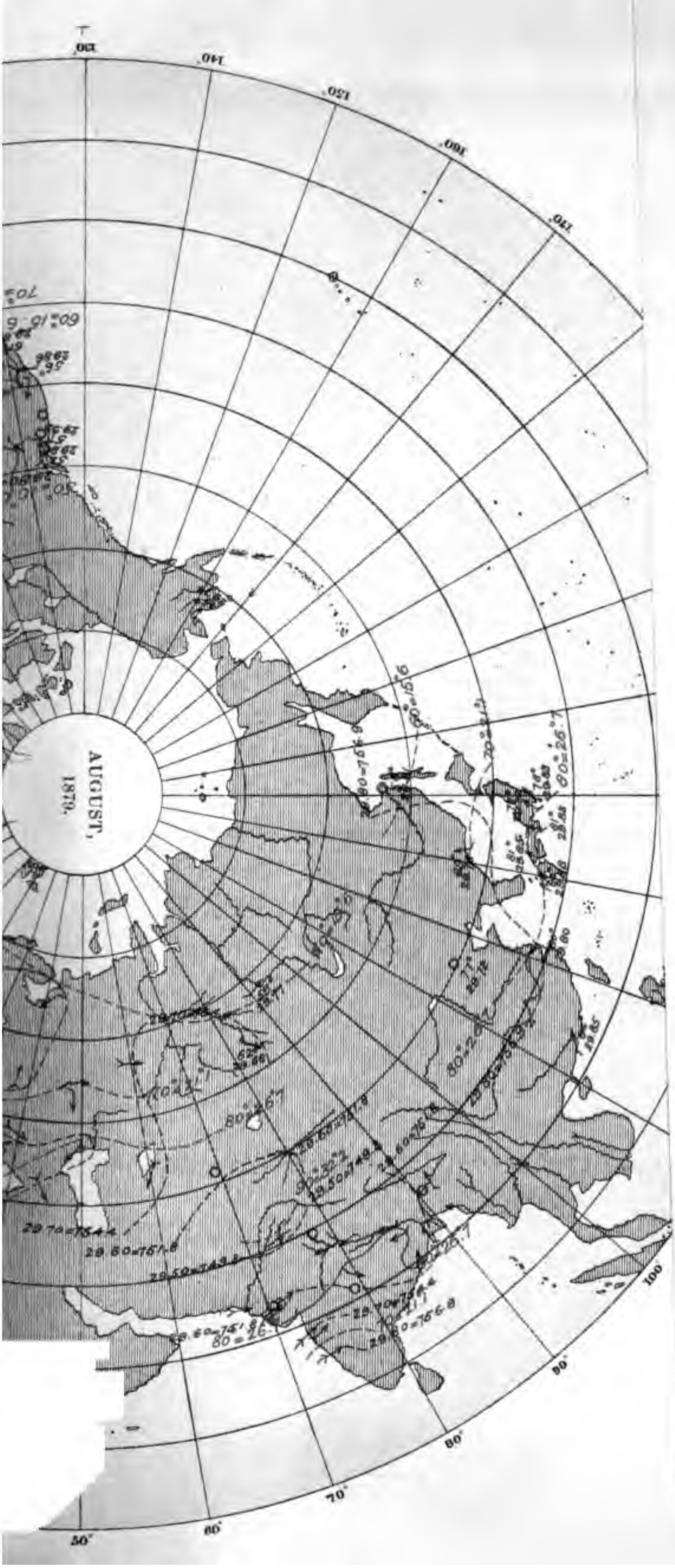
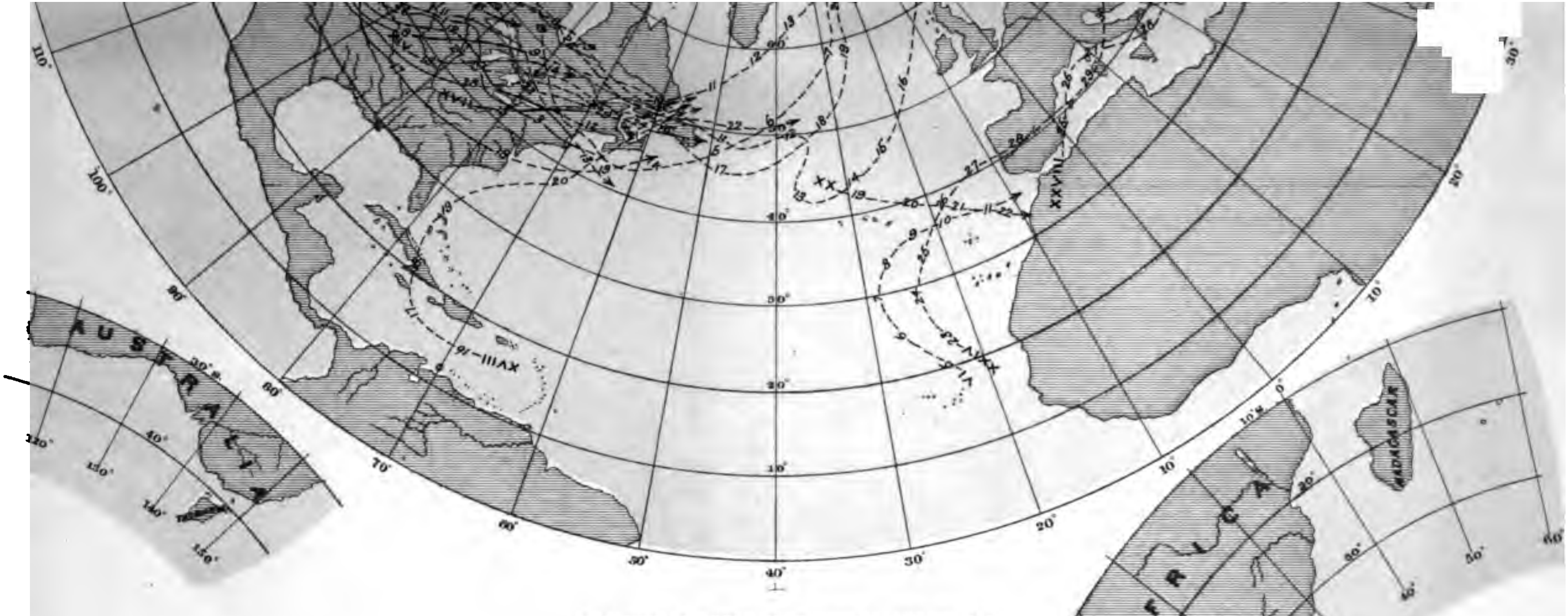

AUGUST,
1879.
50°
60°
70°
80°
90°
100°
130°
140°
150°
160°
170°
29.70=754.4
29.60=751.8
29.50=749.3
29.60=751.8
80=26.7
29.70=754.4
29.80=756.8
80=26.7
70=21.1
60=15.6
70°=21.1
60°=15.6
60°=10.6
70°



PUBLISHED BY ORDER OF THE SECRETARY OF WAR

Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.
Broken or dotted lines, are doubtful.

W. B. Hazen

Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

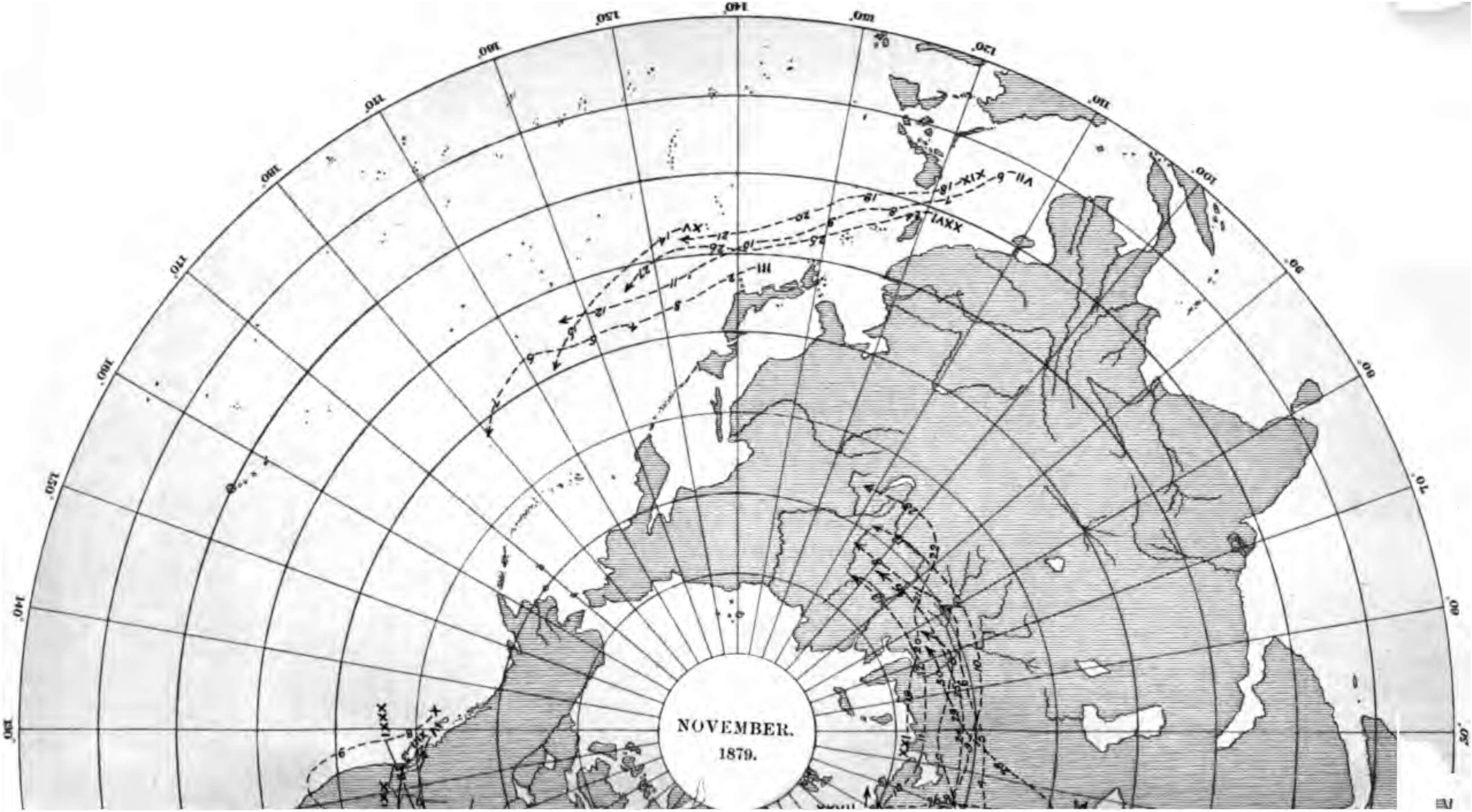
INTERNATIONAL CHART.
Showing Tracks of Centres of Low Barometer for November, 1879.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. [illegible]



APPENDIX No. 80.

MONTHLY WEATHER REVIEW, NOVEMBER, 1881.

INTRODUCTION.

In preparing this review the following data, received up to November 20th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 14 Canadian stations, as telegraphed to this office; 179 monthly journals and 166 monthly means from the former, and 14 monthly means from the latter; 219 monthly registers from voluntary observers; 57 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald Weather Service; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada for the month of November, 1881, is shown by isobaric lines (in black) upon Chart No. II. The areas of lowest mean pressure cover the Lake Superior region and the eastern portion of the Canadian maritime provinces, while their counterpart, the areas of highest mean pressure, occupy the eastern portion of Tennessee, the northwestern portion of the South Atlantic States, and the central portions of the Middle and Northern Plateau regions. Compared with the preceeding month there has been a very decided fall in pressure at most stations north of the 42d parallel and east of the 100th meridian. This region, for the most part, had but just recovered during the month of October from a long period of deficiency, when the month of November introduced a remarkable series of areas of barometric minima in the vicinity of parallel 50° N., a study of which can be made from Chart No. I. With hardly an exception, the pressure throughout the remaining portions of the country has risen, the most decided changes coinciding with the regions of highest mean pressure for the month.

Departures from the normal values for the month.—Compared with the means of previous years, the mean pressure for the present month is everywhere above the normal except in the Upper Lake region, Florida Peninsula, South Pacific coast, and the Upper Mississippi and Missouri Valleys. The regions of greatest deficiency are the Lake Superior and extreme Northwest; departures ranging from 0.05 to 0.09 inch. The regions of greatest excess are found in New England and along the North Carolina coast; the departures ranging from 0.07 to 0.14 inch. On the Pacific coast the departures range from —0.06 inch at San Diego to +0.06 inch at Red Bluff. Stations reporting a normal condition are as follows: Cheyenne, North Platte, Leavenworth, Brownsville, and Winnemucca.

Barometric ranges.—The range of pressure for the month has generally varied from 0.8 to 1.3 inches, and in the extremes from 0.3 inch at San Diego and 0.43 inch at Key West to 1.66 inches at Eastport and 1.87 inches at Deadwood. Throughout the several districts the monthly barometric ranges varied as follows: New England, from 1.17 inches at New Haven to 1.33 inches at Thatcher's Island and 1.66 inches at Eastport; Middle Atlantic States, 0.99 at Lynchburg and 1.00 at Washington to 1.11 at New York and 1.12 at Albany; South Atlantic States, 0.72 at Atlanta to 1.05 at Kittyhawk and 1.08 at Hatteras; Florida Peninsula, 0.43 at Key West to 0.70 at Cedar Keys; East Gulf States, 0.59 at Vicksburgh to 0.75 at New Orleans; West Gulf States, 0.70 at Port Eads to 1.04 at Fredericksburgh and Fort Gibson and 1.09 at Mason; Rio Grande Valley, 0.93 at Castroville to 1.02 at Brackettville; Ohio Valley and Tennessee, 0.71 at Chattanooga to 1.13 at Champaign and 1.15 at Morgantown; Lower Lake region, 1.04 at Cleveland to 1.09 at Detroit and 1.10 at Buffalo and Rochester; Upper Lake region, 1.06 at Port Huron to 1.32 at Duluth and 1.42 at Marquette; extreme Northwest, 1.21 at Bismarck to 1.25 at Moorehead and 1.30 at Fort Stevenson; Upper Mississippi Valley, 0.85 at Cairo to 1.17 at Des Moines and 1.32 at La Crosse; Missouri Valley, 1.06 at Leavenworth to 1.19 at Yankton, and 1.25 at Fort Bennett and Huron; Southern Slope, 0.47 at Coleman to 1.15 at Jacksborough and 1.20 at Henrietta; Middle Slope, 0.83 at Denver to 0.99 at Dodge City; Northern Slope, 0.77 at Cheyenne to 1.22 at Fort Benton and Fort Assinnaboine, 1.87 at Deadwood; Northern Plateau, 0.58 at Lewiston to 0.95 at Boise City and 1.05 at Dayton; Middle Plateau, 0.65 at Winnemucca to 0.78 at Salt Lake City; Southern Plateau, 0.43 at Tucson to 0.54 at Silver City and 0.83 at Phœnix; South Pacific region, 0.30 at San Diego to 0.50 at Visalia and 0.52 at Yuma; Middle Pacific region, 0.52 at Sacramento, and 0.53 at San Francisco to 0.69 at Red Bluff; North Pacific region, 1.00 at Roseburgh to 1.14 at Portland and 1.32 at Olympia.

Areas of high barometer.—Seven distinct areas of high barometer passed over the regions covered by the Signal Service stations, all except one (No. VII), appeared first in the extreme northern portion of the Rocky Mountain region or on the North Pacific coast, and had apparently approached this region from the North Pacific. The average course of movement was to the east after passing the eastern slope of the Rocky Mountains and to the southeast while central in the mountain districts.

No. I.—On the 1st of the month an extended area of cold and dry air appeared on the Pacific coast, moving to the southeast. The pressure rose 0.2 inch above the normal of the month in the Rocky Mountain regions on the 2d, attended by light snow and freezing weather as far south as Santa Fé. The winds shifted to northerly in the Southwest during the afternoon of the 2d, and the p. m. report of that date shows a maximum velocity of 55 miles per hour at Indianola and 48 miles at Galveston. Dangerous northerly winds continued in the Gulf of Mexico during the 3d as the pressure increased to the eastward in the Southern States. This area apparently divided on the 4th, the greater portion remaining in the Rocky Mountain regions, while a detached area moved to the northeast, following the general direction of the coast line to New England, during the 4th, 5th, 6th, and 7th, and then passing over the North Atlantic. Killing frosts occurred at Vicksburgh, Atlanta, Chattanooga, and Charlotte and light frosts at Pensacola, Augusta, and Jacksonville on the 4th, when the pressure was high in Louisiana.

No. II.—This area was central in the Northern Rocky Mountain region on the 9th, when the pressure ranged from 0.2 to 0.5 inch above the normal for the month from the Lake region westward to the Pacific coast. On the 16th the center was clearly located near Saint Paul, and on the 11th and 12th the movement was directly eastward over the Lake region and New England, attended by light snow and killing frosts along the line of greatest pressure. After reaching the Atlantic coast the course apparently changed to the southeast and the area passed on this line beyond the limits of observation.

No. III.—The midnight report of the 13th showed a rapid increase of barometric pressure in British America and north of the Upper Missouri Valley, with a rapid decrease in pressure on the Pacific coast, on the afternoon of the 14th. The barometer was 0.4 inch above the normal in the Northwest, and 0.8 inch below the normal in Washington Territory; this distribution of pressure indicates that this area either originated east of the mountains in British America or passed to that position from Alaska. This area followed the general course of the Missouri Valley until the 15th, and then moved eastward over the Ohio Valley, the center being near Pittsburgh at 11 p. m. on that day. Severe frosts occurred on the morning of the 16th in the Middle States. The barometer continued high on the Atlantic coast during the 17th, but the pressure declined slowly as this area moved northeastward from the Middle Atlantic coast to Nova Scotia, where it was last observed.

No. IV.—During the 18th the pressure was above the normal and increasing in all the districts west of the Mississippi River, the greatest departure being reported on the North Pacific coast, when the center of this area was located near Salt Lake. After passing the Rocky Mountains this area moved slightly north of east over the central portion of the United States, attended by very rapid changes in temperature in the central valleys, a severe norther in Texas, and freezing weather as far south as Shreveport, Vicksburgh, and Augusta on the morning of the 20th. Dangerous northwest winds occurred on the Middle Atlantic and New England coasts on the 20th, the highest velocities being 52 miles per hour at Delaware Breakwater, 44 miles at Cape Henry, 40 miles at Block Island, and 43 miles at Yarmouth—all from the northwest. This area apparently moved eastward from the Middle Atlantic coast after the 20th.

No. V.—The a. m. maps of the 21st clearly defined this area as central in the extreme Northwest and extending over the mountain regions from Mexico to British America. On the morning of the 22d a portion of this large area became detached and moved eastward to the Lake region, leaving the barometer from 0.1 to 0.3 inch above the normal for the month in the mountain districts. On the 22d this area was central over New England, and the temperature was below freezing as far south as Washington. On the 23d the pressure declined on the Atlantic coast as this area moved to the east of Halifax.

No. VI.—Appeared in the upper Missouri Valley on the afternoon of the 23d, and moved to northern Texas, where it was central at the a. m. report of the 24th. Freezing weather was reported from stations west of the Mississippi, and the winds shifted to northerly in Texas as low era No. XIII moved to the east in the Gulf. On the 24th the storm became severe in the western Gulf, when the region of greatest pressure extended over

Indian Territory and Kansas. The lowest temperatures of the month were reported from the Gulf and South Atlantic States, as this area passed over the Southern States. Killing frosts occurred at Indianola, New Orleans, Mobile, Pensacola, and Jacksonville, on the 25th. Special warnings were telegraphed by the Chief Signal Officer to New Orleans and Jacksonville, informing those interested in sugar and fruit crops of the approach of this cold wave. This area advanced to the South Atlantic coast on the 25th, but the barometer continued high in the Southern States until the 28th, when the distribution of pressure was changed by the approach of high area No. VII.

No. VII.—Appeared suddenly at midnight of the 27th north of the Lake region, and advanced from Hudson's Bay over the Saint Lawrence Valley and New England, attended by the lowest temperatures of the month in the northeastern portion of the United States. After reaching the coast the pressure increased to the southward on the 29th, after which the pressure declined, with rising temperature and northeast to southeast winds at stations along the Atlantic coast.

No. VIII.—The history of this area, as it affects the stations east of the Rocky Mountains, will be given in the December Review. On the 30th the pressure was high in the Plateau regions, and the indications were that a cold wave was approaching the Mississippi Valley.

Areas of low barometer.—Sixteen barometric depressions appeared within the limits of the stations of observation during the month of November. Three of these passed from the tropics to the Gulf States, three apparently originated in the Southwest, and three probably passed from the Pacific across the Rocky Mountains to the Lake region. Chart No. I shows that these disturbances occurred in latitudes north of the mean track of November storms.

No. I.—This slight depression passed north of the Lake region on the 1st, unattended by marked atmospheric changes within the United States. At midnight of the 1st the pressure was high in the western districts, and on the Atlantic coast these areas of high barometer were separated by a trough of low pressure in the Mississippi Valley. With the advance of high area No. I, this trough of low pressure was divided and formed low areas Nos. II and III, the former central in Texas on the morning of the 2d, and the latter central in the upper Lake region.

No. II.—Developed in the Southwest on the 1st, attended by rain and warm southerly winds, and disappeared on the 2d in advance of high area No. I, which caused very rapid changes in temperature and high northerly winds over the region covered by this depression on the 2d.

No. III.—This storm appeared in the Upper Lake region on the morning of the 2d, and increased in severity as the center passed northeast to the Saint Lawrence Valley. The pressure at the center of this storm declined as the disturbance moved eastward and the winds became dangerous on the lakes after shifting to westerly. The sudden fall of temperature and the area of precipitation attending this storm extended over all districts east of the Mississippi. Heavy snows fell in the Lake region, where brisk and high westerly winds continued until the 4th, when the center of disturbance was near Eastport. Northwesterly gales occurred on the North Atlantic coast north of Cape Hatteras on the night of the 3d. Cautionary signals were ordered from eight to twenty-four hours in advance of this storm at stations on the Atlantic coast, but the cautionary signals ordered for the Lake ports were in some cases late. This storm crossed the Saint Lawrence Valley on the night of the 3d, and increased in energy until the night of the 4th, when the pressure at the center had fallen to 29.04 inches at Anacosti Island, with the wind reported as a gale from the south at 11 p. m. The gale continued at this station on the 5th, the wind shifting to westerly, and at Father Point the wind increased to 45 miles per hour. This storm apparently moved to the southeast after leaving the Gulf of Saint Lawrence and probably moved to the north of the track of vessels passing from Europe to America.

No. IV.—Was central in the Lower Missouri Valley on the afternoon of the 4th, while low era No. III was passing to the northeast of New England. This disturbance was first observed in the Northern Rocky Mountain region on the night of the 3d; the track of the center being southeast until it reached the Mississippi Valley, after which the course was northeast over the Lake region and Saint Lawrence Valley. Light snow and rain fell at stations north of parallel 40° as this depression passed to the east during the 4th and 5th. The highest winds occurred on the Lower Lakes, the track of disturbance being confined to narrow limits. The highest velocity reported was 36 miles per hour from the southwest at Sandusky.

No. V.—The p. m. report of the 5th indicated the presence of a disturbance in the West Gulf, and the midnight report of the same date shows that during the preceding eight hours the wind reached a velocity of 32 miles per hour at Galveston and 36 miles at Indianola. This storm moved to the northeast, the center passing near Port Eads, at the mouth of the Mississippi, during the 6th. Very heavy rains occurred in the Gul

States, and dangerous winds were reported in the East Gulf. Pensacola reported a velocity of 40 miles per hour from the southeast on the night of the 6th. This storm disappeared as a cyclonic disturbance after reaching the East Gulf States.

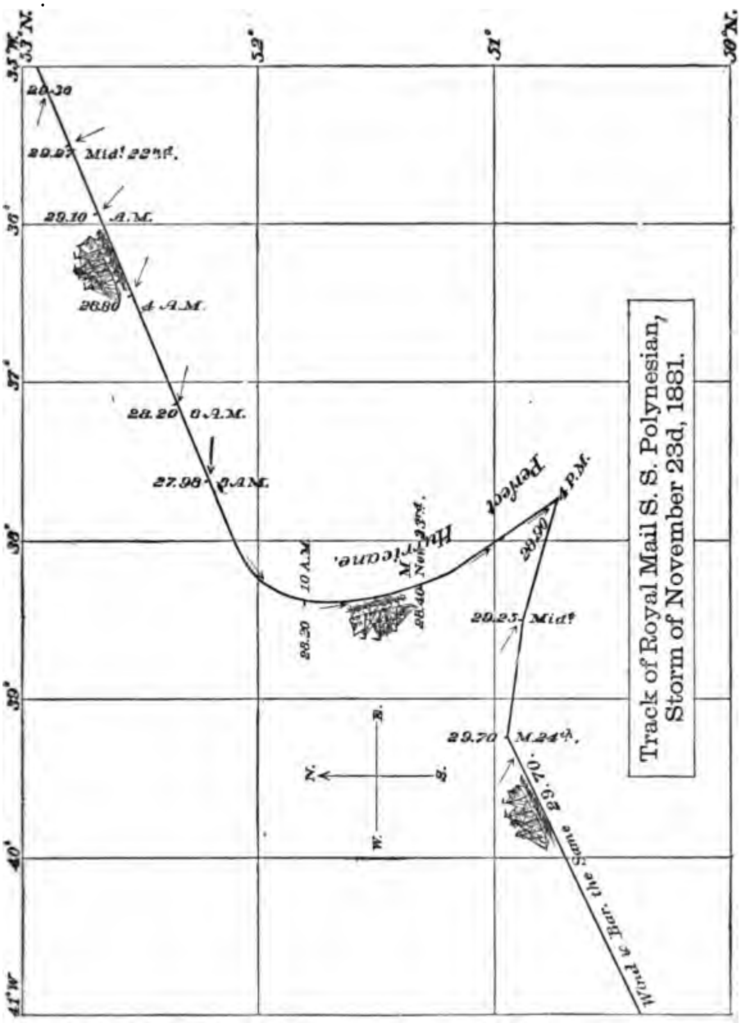
No. VI.—This storm passed from the Pacific east of Portland on the 5th, causing heavy rains in Oregon and Washington Territory. The barometer fell to 29.47 inches at Olympia on the afternoon of the 5th, when the center was near that station. Heavy snows occurred in Montana and Idaho on the 6th, as this depression passed over the mountains. On the morning of the 7th the center of greatest depression was located near Pembina, where the barometer indicated a pressure of 29.34 inches. The p. m. chart of this date exhibits a trough of low pressure extending from Texas to British America; the barometer being high in New England and the winds in all districts east of the Mississippi from south to east, apparently under the influence of this depression. The storm continued to move eastward, and passed over the Lake region on the 8th, causing high winds at all stations on the Upper Lakes and Lake Erie. The maximum velocities occurred after the winds had veered to the west. This storm crossed from the Pacific to the Atlantic in five days and eight hours, approximately on the parallel of the northern boundary of the United States, and it left the Atlantic coast attended by severe gales in the Northeastern Provinces. These gales continued during the 10th and 11th after the center of disturbance had passed east of the coast line. Cautionary signals were displayed at the Lake ports and on the Atlantic coast north of Cape Henry, giving warning of the approach of this storm.

No. VII.—The distribution of barometric pressure over the United States on the 10th indicated the development of a storm south of the Gulf States, where this area was probably central. The p. m. report of the 10th placed the center of this disturbance in the Rio Grande Valley near to and northeast of Brownsville, and succeeding reports indicated the advance of this storm to the northward, immediately toward the high area, which then extended over the Lake region. This storm moved northerly until the center reached a point near Omaha on the afternoon of the 11th, and then moved to the northeast. Heavy rains fell on the 11th and 12th in the Mississippi and the Ohio valleys and Lake region, and severe gales occurred at the Lake stations as the center passed from northern Iowa over Lake Superior. Cautionary signals were displayed at all stations on the lakes in advance of this storm. The maximum velocities as reported were as follows: Milwaukee, 45 miles; Grand Haven, 40 miles; Alpena, 42 miles. The above wind velocities indicate the severity of the storm in the Lake region. The cautionary signal at Chicago was not justified at this station, the highest velocity which occurred during the storm being 22 miles per hour, but vessels attempting to leave this port were compelled to return. This depression advanced rapidly to the Lower Saint Lawrence Valley during the 12th and 13th, followed by clearing, colder weather in the Mississippi Valley and light rains in the Lake region and the Middle States. The barometer continued to fall at the center as this storm advanced to the east, and when last observed on the morning of the 14th the pressure was 29.43 inches at Anacosti, with the wind reported as a gale from the west.

No. VIII.—The a. m. report of the 14th indicated the presence of this depression off the North Pacific coast, the barometer at Portland then reading 29.43 inches. The midnight report of the 14th showed that threatening weather and rain had extended as far south as San Francisco, and that all winds on this coast had veered to southerly. This depression probably crossed the Rocky Mountains, but the chart of barometric departures indicated that two depressions existed in this region on the morning of the 14th, and the one in advance has been traced continuously for each telegraphic report, and therefore marked as a separate storm.

No. IX.—Central in the Saskatchewan region at midnight of the 14th, the storm passed southeastward, following the course of the Missouri Valley until the a. m. report of the 16th, when the center of disturbance was located near Yankton. From this point the course changed to the northeast, and during the 17th this storm increased in energy as it passed over the Lake region and thence to the eastward. The increase of pressure in the western quadrants was very rapid, and the temperature fell from 20° to 30° in the Northwest. This storm continued its easterly movement after leaving the Lake region, but became much enlarged as it approached the northeastern coast. The lowest reading of the barometer observed was 29.12 inches at Anascoti on the afternoon of the 18th, when the stations on the Atlantic coast north of Cape Hatteras were within the limits of this depression, the winds being from brisk to high and from the southwest at stations along the coast.

No. X.—This storm developed in Texas during the night of the 17th, and was central near Denison on the morning of the 18th, the isobar of 29.90 inclosing the area and forming an elongated ellipse with the longer axis pointing in the direction of the storm movement. This depression was forced rapidly to the east by the high area which was advancing from the Upper Missouri Valley. The rush of cold air from the north caused a marked depression in temperature at stations on the eastern slope of the Rocky Mountains on the morning of the 18th. The 3 p. m. report of this date shows temperatures of 77° at Memphis, 33° at Fort Gibson, 56° at Saint Louis, and 25° at Leavenworth. Very heavy rains fell on the 18th in Missouri, Illinois, Indiana, and Kentucky, causing damaging floods in the tributaries of the Ohio. Snow and sleet continued in the northern districts during the 19th, as this storm-center passed over New York and New England. The winds increased in force on the Lower Lakes near the center of disturbance and on the Middle Atlantic coast after shifting to the northwest. The highest velocities reported were as follows: Sandusky, 48 miles from the west; Delaware Breakwater, 40 to 52 miles during the 36 hours ending at 7 a. m., November 20. The following reports, furnished through the co-operation of the New York Herald Weather Service, indicate the presence of this storm as it passed eastward over the ocean: Steamship Gallia, 20th, 7 a. m., in 45° 13′ N., 44° 31′ W., 29.75, W., force 5, high WNW. sea, overcast and rain; noon, in 45° 02′ N., 45° 03′ W., 29.70, SW., force 5, high WNW. sea, overcast and heavy rain. 21st, 7 a. m., in 43° 55′ N., 48° 19′ W., 30.15, NNW., force 8, cloudy weather, stormy gales and hail; noon, in 43° 40′ N., 49° W., 30.22, NNW., force 8, high gales and hard squalls with hail. Steamship Wyoming, 20th, 7 a. m., in 47° 30′ N., 41° 50′ W.,



Track of Royal Mail S. S. Polynesian,
Storm of November 23d, 1881.

FIG. 2.

29.60, NNW., force 7, confused sea, overcast and cloudy; 3 p. m., in 47° N., 44° W., 29.10, ESE., force 4, confused sea, gloomy weather, sleet and snow. 21st, 7 a. m., in 45° 45′ N., 47° 25′ W., 30.00, W., force 9, overcast and cloudy; 3 p. m., in 45° 20′ N., 48° 58′ W., 30.13, WSW., force 7, overcast and cloudy. Steamship City of Chester, 21st, 10.26 a. m., in 50° 34′ N., 25° 20′ W., 28.20, SSW., force 9, high confused sea, dark, cloudy weather with thunder and lightning; at 1.20 p. m., wind suddenly shifted in a terrific squall from SW. to NW., and blew with hurricane force for three hours. 22d, 10.10 a. m., in 50° 15′ N., 29° 40′ W., 29.40, W., force 7, partly cloudy weather. 23d, 9.50 a. m., in 49° 10′ N., 44° 20′ W., 27.97, SW., force 12, dark heavy clouds with violent squalls of rain and hail. 24th, 9.40 a. m., in 49° N., 36° 30′ W., 29.62, W., force 10, partly cloudy weather with violent squalls of rain and hail. Steamship Italy, 24th, in 48° 34′ N., 31° 50′ W., hurricane from N. to NW., barometer fell from 29.60 to 28.20.

Nos. XI and XII.—Were observed in the region north of Dakota on the 20th and 22d, and moved directly east, north of the Lake region, causing slight changes in the atmospheric conditions over the United States. No. XI developed great energy as it approached the Newfoundland coast. Violent gales occurred at Father Point, Yarmouth, and in the Atlantic east of these stations. This storm probably continued its easterly course over the Atlantic, as is indicated by the reports from the steamship Polynesian on the 23d in the latitude and longitude given in the chart on page 127.

The following is a copy of the letter of Commander R. Brown, addressed to the Chief Signal Officer and accompanying the above chart:

"Having experienced very heavy weather during my last passage from Liverpool to Boston, and particularly on the 23d ultimo, when we encountered quite a hurricane, I herewith inclose you a diagram, with the ship's position, direction of the wind (as per arrows), and the heights of the barometer, with a few remarks on the same. Tuesday, 22d of November, noon, strong gales from northwestward, which had been blowing much the same for the previous twenty-four hours, barometer ranging between 28.90 and 29.36. Towards midnight the wind fell calm. Then a light air sprung up from the south, veering toward the southeastward; weather very dark, much lightning all round, more so towards the southeastward; no thunder; several composants, *i. e.*, St. Elmo lights, on the yards and stays, glass falling rapidly and sea very high and turbulent; 8 a. m., strong gale from SE., with snow and hail squalls; 10 a. m., blowing a hurricane from E.; squalls terrific, with terribly high and confused sea. Kept ship running before it; would have been highly dangerous to attempt to round too. Noon, 23d, glass rising rapidly; blowing as hard as ever; sea a complete mass of spindrift, high and awfully confused; squalls succeeding each other rapidly and roaring with their violence; 3 p. m., weather breaking; 4 p. m., wind NNW., rounded too, ends strong, gale from northwestward, with a high confused sea; obliged to keep ship's stem on and steam easy. This weather continued much the same till the evening of the 24th, wind from the same quarter NW., when it moderated and went round to the southward for about twelve hours; it then got back to the northwestward, where it continued for the remainder of the passage, occasionally getting to WSW. and back again."

The track of this vessel with the direction of the wind and the readings of the barometer are also given on this chart as reported. The Chief Signal Officer takes this occasion to express his high appreciation of the valuable reports and diagrams furnished by Commander R. Brown, of the "Allan" royal mail steamship Polynesian. No. XII passed to the east off the coast on the 24th as a severe storm, the barometer at Sydney falling as low as 29.14 and that at Anacosti to 29.19. The following report taken under the direction of Commander Jules Ueberweg, of the steamship Nederland, of the Red Star Line, indicates that this storm continued its easterly course over the Atlantic to 51° N., 22° W. This vessel was five days in passing from longitude 23° to longitude 30°. The following observations were taken on this vessel during the storm:

Date.	Wind.	Course.	Distance.	Latitude.
				° ′
November 27	WNW.	S. 86° 27′, W.	210 miles.	50 57
November 28	NW.			50 35
November 29	NW. to WSW.			50 47
November 30	WSW. to NW.			50 49
December 1	WNW.			50 47

Date.	Longitude.	Barometer.	Temperature.	Remarks.
	° ′		°	
November 27	22 52	29.13	43	Violent and terribly high sea.
November 28	21 56	29.57	42	Violent and terribly high sea.
November 29	24 58	29.18	45	Stormy and boisterous; furious high sea.
November 30	25 40	29.40	44	Stormy and boisterous; furious high sea.
December 1	28 57	29.40	45	Wind and sea abating gradually.

The following reports furnished through the co-operation of the New York Herald Weather Service indicate the presence of this storm as it passed eastward over the ocean: Steamship Wyoming, 24th, 7 a. m., in 41° 26′ N., 63° 46′ W., 29.38, SW., force 7, high westerly sea, gloomy weather and rain; 3 p. m., in 41° 05′ N., 65° 40′ W., 29.42, WNW., force 6, overcast and rain. 25th, 7 a. m., in 40° 30′ N., 69° 08′ W., 30.08, WNW., force 7, partly cloudy weather. Steamship Gallia, 24th, 7 a. m., in 41° 52′ N., 66° 17′ W., 29.40, S., force 4, overcast and rain; noon, in 41° 45′ N., 67° 40′ W., 29.30 NW., force 4, cloudy weather and rain.

No. XIII.—Appeared in the Gulf of Mexico, south of the mouth of the Mississippi River, on the afternoon of the 22d. This storm became well defined, and passed northeast over Florida, causing high winds in the East Gulf. Signals were ordered for stations on the Atlantic coast as far north as Norfolk, but the depression either filled up or passed rapidly to the east off the South Atlantic coast, causing but slight disturbances at stations between Cape Hatteras and Jacksonville. The signals ordered for stations on the Gulf coast were justified; those ordered for Jacksonville, Savannah, Charleston, and Wilmington were not justified at the stations. A vessel attempted to leave port at Jacksonville but was compelled to return.

No. XIV.—First observed in British America northwest of Fort Garry on the 24th, and by the morning of the 25th it had moved southeastward to Lake Superior, causing high winds and snow in the Lake region. On the morning of the 26th the center of disturbance was north of Lake Ontario, but generally fair weather continued in the districts on the Atlantic coast and south of the Lake region. This storm was followed by a slight depression, which developed into a severe storm in the Saint Lawrence Valley on the night of the 27th. The rapid advance of high area No. VII from the Hudson Bay region caused a rapid increase in the barometric gradient to the west of the center of this secondary storm, and high westerly winds were reported from Sydney, Yarmouth, and other stations in that region. The following reports furnished through the co-operation of the New York Herald Weather Service indicate the presence of this storm as it passed eastward over the ocean: Steamship Italy, 26th, in 47° 44′ N., 38° 15′ W., 29.10, heavy westerly gale, with squalls and very high sea. 27th, in 47° 09′ N., 41° 03′ W., heavy NNW. gales, slightly abating, with hail squalls and cloudy weather. Steamship Republic (?) 26th, in 51° N., 24° 15′ W., 28.56, WSW., force 11, terrific storm, violent squalls and high sea. 27th, in 50° 35′ N., 26° 34′ W., 29.31, WNW., force 10, terrific gale, violent squalls and high sea.

No. XV.—Advanced from the Upper Missouri Valley on the afternoon of the 27th, but probably originated west of the Rocky Mountains. The center of this storm passed far to the north of the Lake region, but the southern half of the depression included within its limits all districts north of Tennessee and Virginia. As the center passed to the east the weather continued fair, except at extreme northern stations, with rising temperature and south to east winds.

No. XVI.—Developed in the Southwest on the 29th, and after passing over the Mississippi Valley and Lake region as an area of rain and snow it was central north of Lake Erie at the close of the month. The temperature fell below freezing in the Rocky Mountain regions as far south as El Paso, as this storm moved to the east of the Mississippi. Cautionary off-shore signals were ordered on the 30th for Indianola and Galveston in anticipation of the light norther, which occurred in Texas on December 1.

INTERNATIONAL METEOROLOGY.

International Charts Nos. IV and V accompany the present Review. The former is published for September, 1879, and continues the series of this chart commenced in January, 1877. Chart No. V is prepared for the month of December, 1879, and continues the series of this chart commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m. Washington or 0.43 p. m. Greenwich mean time, for the month of September, 1879, over the Northern and at certain isolated stations in the Southern Hemisphere. Two areas of mean barometric minima appear upon the chart for the present month, one (29.40) over Greenland and Iceland and the other (29.80) on the western coast of Africa in the vicinity of 8° N., 13° W. The former shows the lowest monthly mean pressure that has been recorded at Stykkisholm for the past three years. From the prevailing direction of the winds at Godthaab and Stykkisholm it would appear likely that a still lower mean pressure than that reported at Stykkisholm obtained in the vicinity of 70° N. During this month no less than seven storms, most of them displaying great energy, passed northeastward over the ocean between Greenland and the British Isles, entering Europe on the coast of Norway. The second area of low mean pressure presents even more unusual features of interest than does the first. As a rule the mean barometer along this portion of the western coast of Africa very rarely falls below 29.90 or 29.85, while at Free Town this month, the anomalous mean barometer of 29.75 is reported. At no time during the month did the daily reading at this station rise above 29.79 or fall below 29.67. The usual area of low mean pressure in Hindostan is for the present month, 29.70, although in northwestern Bengal and the Punjab the monthly mean is about 29.60. Elsewhere throughout the Northern Hemisphere the pressure is generally 30.00 or above. There are two principal areas of high mean pressure, 30.30 in the vicinity of the Azores and 30.20 in central Russia. Both of these areas embrace circumscribed regions; the former is a gradual increase of 0.06 to 0.10 inch over the mean of August, while the latter resulted from a decided increase of 0.25 to 0.40 inch over that month. The area of 30.10 over the Atlantic covers an immense region between the parallels of 20° and 50° N., and the meridians of 10° and 75° W., and as compared with the previous month of August is an enlargement of more than double its former proportions. The extreme mean pressures for the month are 29.38 (lowest) at Stykkisholm and 30.27 (highest) at Punta Delgado. The extreme monthly range of mean pressure is 0.89 inch, which is 0.33 inch larger than September, 1877, and 0.20 inch larger than September, 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: lowest, Godthaab, 35°; York Factory, 38°; Stykkisholm, 43°; Moose Factory and Nikolaievsk, on the Amoor, 47°; Yeniseisk, 49°; highest, Biskra, 92°; Lahore, 90°; Athens and Murcia, 83°; Manilla, 82°. The prevailing direction of the winds over the United States, was northeasterly throughout the Atlantic States from southern Florida to New England; in the Gulf States, northeast to southeast; in the Lake region, southwest to northwest; in the northwest and Upper Missouri Valley, northwesterly; in the Lower Missouri Valley and westward to the Rocky Mountains, southerly; in the Plateau and Pacific Coast regions, southwest to northwest. Over Canada and the maritime provinces, southwest to northwest. In central Mexico, northeast to northwest. Over the Atlantic Ocean, northeast to southeast south of parallel 40° N., and to the northward of that parallel, northeast to southwest and northwest. In Europe, southwesterly over the British Isles and Scandinavia and thence southeastward to the central portions of France and Germany, beyond which the winds over the remainder of Europe prevail from the northeast, southeast, and northwest, modified by a strong tendency to variable in Spain and Italy. In Algeria the winds are northwesterly. In Hindostan, westerly along the western coast, elsewhere variable. Along the Asiatic coast and over the Japan Islands, northerly. Compared with September, 1877 and 1878, the temperature over the United States is generally lower over the western portions, but susceptible of little change east of the 100th meridian. The pressure is decidedly higher between the 80th and 100th meridians; elsewhere little or no variation. Over the Atlantic, where comparison can only be made with 1878, the regions of highest pressure between the parallels of 20° and 50° N. show an increase of from 0.05 to 0.20 inch. Northward of 50° N. there appears a decrease pressure of from 0.05 to 0.30 inch. The temperature southward of 50° N. shows but little if any change, except in a narrow belt north of 45° N., where a fall of from 1° to 2° occurs. Northward of the 50th parallel the fall continues with greater positiveness. In the various countries of Europe the following changes appear: over the British Isles the pressure is from 0.01 to 0.20 inch lower, while the temperature shows but very little variation. In Scandinavia the pressure is generally higher, ranging from 0.01 to 0.25 inch; the temperature is from 3° to 6° higher. In Denmark the change in pressure is a plus quantity showing a variation of from 0.10 to 0.15 inch, while the temperature is from 5° to 10° higher. In France there is a general but comparatively slight rise in pressure and a small minus variation in temperature. In Germany and Austria there is a general rise in pressure of from 0.05 to 0.10 inch; the temperature in both countries shows a rise of from 2° to 6°. In Italy there is a rise in pressure of from 0.01 to 0.05 inch and of temperature from 1° to 4°. In Spain and Portugal there is a rise in pressure of from 0.01 to 0.05 inch and a general fall in temperature. In Russia the rise in pressure is more decided than in any other country of Europe, being an increase of from 0.15 to 0.35 inch; the temperature is everywhere higher, generally from 3° to 10°. In Hindostan the pressure is considerably higher along the western coast; elsewhere lower; the temperature is generally higher north of the Ganges, lower to the southward, and showing but little if any change along the western coast. In Algeria the pressure is generally higher, while the temperature shows a condition quite the reverse. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of September, 1879, as compared with the means of the past two years:

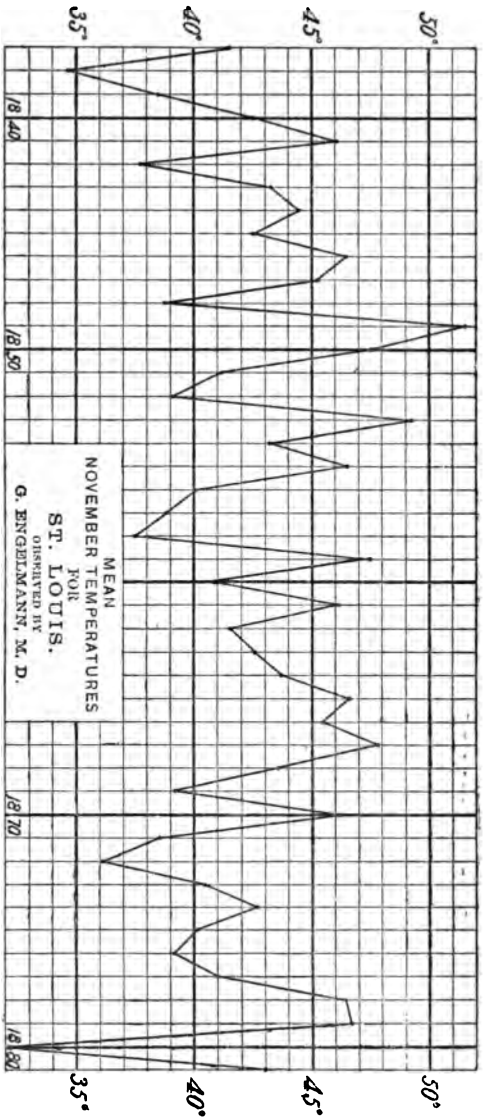
Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.		
	September, 1877-'78.	September, 1879.	Departure.	September, 1877-'78.	September, 1879.	Departure.
	°	°	°			
York Factory	36.1	37.5	+1.4	29.84	30.09	+0.25
Godthaab	39.8	34.6	—5.2	29.73	29.69	—0.04
Stykkisholm	45.6	43.2	—2.4	29.71	29.38	—0.33
Tromso	46.5	50.8	+4.3	29.62	29.63	+0.01
Thorshavn	50.8	49.9	—0.9	29.81	29.55	—0.26
Archangel	48.0	52.9	+4.9	29.69	30.01	+0.32
Ekaterinburg	52.2	52.3	+0.1	29.81	30.04	+0.23
Barnaul	59.1	55.4	—3.7	29.88	29.90	+0.02
Yeniseisk	51.0	48.9	—2.1	29.83	30.04	+0.21
Nikolaievsk, on the Amoor	50.9	46.9	—4.0	....	....	....
Zi-Ka-Wei	60.4	71.6	+2.2	29.94	29.91	—0.03
Tokei	69.7	68.0	—1.7	29.90	29.92	+0.02
Pekin	69.0	66.7	—2.3	29.96	29.96	Norm'l
Tashkend	69.6	67.5	—2.1	30.00	30.01	+0.01
Nukuss	76.7	72.9	—3.8	29.93	30.08	+0.15
Beirut	85.1	85.0	—0.1	29.85	29.85	Norm'l
Mauritius	73.6	72.5	—1.1	30.13	30.17	+0.04
Fort Napier	....	....	....	....	....	....
Cape Town	64.6	64.7	+0.1	30.14	30.13	—0.01
Free Town	82.1	80.8	—1.3	29.96	29.75	—0.21
Paramaribo	83.4	82.0	—1.4	30.07	30.03	—0.04
Funchal	76.2	74.7	—1.5	30.07	30.16	+0.09
Ponta Delgado	73.3	74.2	+0.9	30.16	30.27	+0.11
Angra	69.9	71.1	+1.2	30.14	30.26	+0.12
Bridgetown	83.1	83.2	+0.1	29.92	29.95	+0.03
Navassa	83.4	82.5	—0.9	29.91	29.96	+0.05
Medellin	68.9	66.9	—2.0	....	....	....
San José de Costa Rica	67.6	68.0	+0.4	....	....	....
Mexico	55.4	54.7	—0.7	30.08	30.10	+0.02
Melbourne	52.3	53.6	+1.3	30.04	30.01	—0.03
Hobart Town	51.1	50.9	—0.2	29.85	29.90	+0.05
San Juan de Puerto Rica	81.0	81.9	+0.9	29.91	29.99	+0.08
Nassau	84.3	82.0	—2.3	29.95	30.02	+0.07
Havana	82.1	81.2	—0.9	29.93	29.97	+0.04
Astrakhan	70.9	69.3	—1.6	29.95	30.12	+0.17
Athens	83.2	83.0	—0.2	29.93	29.98	+0.05
Lahore	92.2	89.8	—2.4	29.63	29.62	—0.01
Tiflis	77.3	74.5	—2.8	29.90	29.98	+0.08
Laghouat	83.7	85.3	+1.6	30.04	30.02	—0.02
Fort de France	81.5	80.1	—0.4	29.84	29.97	+0.13
Yokohama	69.8	69.9	+0.1	29.91	29.91	Norm'l
Lisbon	73.8	69.1	—4.7	30.00	30.13	+0.13
Madrid	77.8	74.7	—3.1	....	....	....
Cagliari	79.1	79.4	+0.3	29.91	29.98	+0.07
Gibraltar	....	....	....	29.97	30.03	+0.06
Sandwick Manse	53.4	53.8	+0.4	29.87	29.75	—0.12
Malta	83.6	81.4	—2.2	29.93	29.94	+0.01

Chart No. V.—This chart displays the tracings of the probable courses of thirty-four of the principal storm areas of the Northern Hemisphere for the month of December, 1879. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from the logs of vessels of the merchant marine of the North Atlantic and Pacific Oceans. Concerning the general distribution of the paths of the areas of barometric minima the following is given: nineteen areas traversed portions of the United States, eight of which came from the Pacific Ocean; eleven reached the Atlantic Ocean, five of which crossed the same to the mainland of northern Europe. Two areas crossed British Columbia from the Pacific. One area first appeared over Hudson's Bay and passed northeastward into northern Greenland. Another area developed over the Atlantic Ocean near the Azores. One area first appeared in southwestern Europe, two in extreme northern Europe, one in southern Russia, and one in western Siberia. Six areas formed over the seas bordering the Asiatic coast. Of the storms in North America the following descriptions are given: No. I.—This area formed in the Lower Missouri Valley as the result of a general depression over the northern territories. Accompanied with snow and high northerly winds the storm passed northeastward to southern Michigan and thence, with increased rapidity, to the Canadian maritime provinces, where the area became central on the morning of the 4th. During the day the depression passed off the coast of Newfoundland and on the following morning was central in about 50° N., 50° W. On this day the depression nearly disappeared under the influence of two high areas, 30.20 and 30.40, the former northeast of the Azores and the latter over New England. During the 6th, as the latter rapidly advanced, the former slowly receded, resulting finally in a division of the now narrow and elongated depression, which reached from Iceland southwestward to about 40° N., 40° W. The southern arm of the depression passed southeastward to the Azores and thence eastward along the 40th parallel to the meridian of 20° W., when its course changed to northerly, the depression disappearing near parallel 50° N. The lowest readings reported during the progress of this subsidiary area occurred on the 9th at Angra and Ponta Delgado, 29.00 and 29.34 respectively, winds south. The northern arm passed northward to Iceland, where, on the 7th, it became central off the western coast; Stykkisholm, 29.27, a fall of 0.39 inch in past twenty-four hours, wind SW., force 8, rain. 8th, depression central off the northwestern coast of Norway; Tromso, 29.32, a fall of 0.65 inch, SW., rain; Stykkisholm, 30.04, a rise of 0.77 inch, NE., force 6, snow. 9th, central over Lapland; Tromso, 28.92, a fall of 0.40 inch, SW., snow; Haparanda, 29.36, a fall of 0.37 inch, W., fair; Archangel, 29.08, a fall of 0.45 inch, drifting snow. 10th, central north of parallel 60° N., and between the meridians of 50° and 60° E.; Archangel, 29.22, a rise of 0.14 inch; during the day the depression remained about stationary, owing to the presence of a high area over southwestern Siberia, and on the 11th gradually filled up over the western portion of that country. No. II.—This area formed off the North Pacific Coast region on the 1st, and passed northeastward over British Columbia, affecting decidedly the pressure over the northern territories, from the influence of which area No. I resulted. The further course of area No. II in the British Possessions could not be traced, owing to lack of reports. No. VI.—This area appearing off the North Pacific coast on the 2d, soon followed the disappearance of area No. II. On the 3rd was central in southern Idaho, with rain or snow, quite general in the Middle Plateau region. During the day passed southeastward over Utah, and thence eastward into Colorado, where, on the 4th, it was central, the area 29.80, embracing the country from Washington Territory eastward to Minnesota and southward to include Texas. 5th, depression central in the Lower Missouri Valley, with greatly increased energy. During the day passed northeastward to the Upper Lake region, where it was central on the 6th with still greater energy; lowest barometer at Marquette 29.25, a fall of 0.63 inch, wind SE., snow. 7th, central over northern Canada in the vicinity of 50° N., 80° W.; Moose Factory, 29.34, a fall of 0.20 inch, wind shifted from S. to NW., with heavy snow. During the 7th and 8th, the course of the depression, as indicated upon the chart, is rather doubtful, owing to the lack of sufficient reports. It seems very probable, however, that the depression passed to the north of Godthaab, as shown by the following observations made at that station: 7th, 29.72, calm; 8th, 29.40, SSE., snow; 9th, 29.44, SW., cloudy; 10th, 29.91, calm, snow. During the 9th, depression disappeared under the influence of a high pressure area, 30.20, then prevailing off the west coast of Iceland. No. VIII.—This area formed off the North Pacific coast on the 6th and passed southeastward over Washington Territory, and the Northern and Middle Plateau regions to Colorado, where it was central on the morning of the 7th. Snow, with high northwest winds, accompanied the depression in the Plateau regions. During the 7th the depression passed southeastward into Texas, where it dissipated by the following morning under the influence of a high pressure area from the Northwest which advanced rapidly southeastward. No. IX.—During the 7th the barometer fell quite rapidly over northern California with heavy rain and gales along the Middle Pacific coast, followed later in the northern portions of California and Nevada by heavy snow. 8th, central in the Middle Plateau region, Salt Lake barometer 0.66 inch below the normal. During the day the depression passed eastward to western Kansas and Nebraska preceded by fresh to brisk southeast to southwest winds with rain and snow eastward to Lake Erie. 10th, central over Lake Superior with greatly increased energy, lowest barometers at Duluth and Marquette, 29.16 and 29.17, respectively, winds southwest. During the day the depression advanced rapidly northeastward over Canada, being central on the morning of the 11th in about 50° N., 70° W., where the central area appeared to be inclosed by the isobar of 29.40. On this day and the following the depression passed eastward south of Greenland. The following observations taken at Godthaab, Greenland, show the influence of the depression during its approach and passage: 11th, 29.77, ENE.; 12th, 29.01, ENE.; 13th, 29.21, NNE.; 14th, 29.33, SW. The following observations were taken at Stykkisholm: 11th, 29.84, S., rain; 12th, 29.56, S., cloudy; 13th, 29.23, S., rain; 14th, 29.16, SW., snow; 15th, 29.34, SW., snow. On the 14th the depression was probably central in about 70° N., 5° E.; Tromso, 28.96, a fall of 0.52 inch, SW., rain; Brono, 29.40, S. W., rain. 15th, central over Lapland; Tromso, 28.87, W., snow; Haparanda, 29.28, W., clear; Archangel, 28.98, a fall of 0.72 inch, W., fair. 16th, central in about 60° N., 50° E.; Archangel, 29.24, WNW., drifting snow; Ekaterinburg, 29.10, a fall of 0.76 inch, WSW.; Kasan, 29.28, a fall of 0.54 inch, W. 17th, central in the valley of the Obi near 60° N., 70° W.; Ekaterinburg, 29.34, WNW.; Kasan, 29.71, NW.; to the eastward, in the provinces of Tomsk and Yeniseisk, the barometer fell slowly, winds shifting to easterly with snow. 18th, central with increased energy in the northern portion of the province of Tomsk; Barnaul, 29.80, a fall of 0.35 inch, SW., snow; Yeniseisk, 29.85, a fall of 0.16 inch, SSE. 19th, Yeniseisk, 29.71, S.; Barnaul, 29.91, SW., heavy snow. During the day the depression probably disappeared in a high pressure area 30.60, then prevailing over northern China. No. X.—This area formed over the Northern Plateau on the 9th, and by the following morning became central in eastern Utah, inclosed by the isobar of 29.80. During the 10th the depression lost its identity over southern Colorado, under the influence of a high pressure area 30.40, which passed rapidly southeastward from Manitoba in rear of area No. IX. No. XI.—Following the passage eastward of the previously mentioned high area, this depression formed in the Saskatchewan Valley on the 12th, and passed southeastward into Wyoming, where it became central on the following morning. During the day the depression passed southward into western Kansas, disappearing on the 14th over northern Texas. High westerly winds and snow were reported from central Colorado on the 13th; Pike's Peak, NW., 56 miles. No. XII.—This area formed over the western portion of the Gulf of Mexico on the 13th, accompanied by northerly gales and rain along the Texas coast. 14th, depression central in the vicinity of New Orleans, with no decided fall in the barometer at coast stations. From Mississippi northward to the Lakes and northeastward to New England, northeasterly winds with rain or threatening weather prevailed. During this day the depression passed rapidly northeastward over the Southern States, and by the morning of the 15th was central in the Lower Saint Lawrence Valley, inclosed by the isobar of 29.60. Light rain or snow, with northeast to southeast winds, prevailed in New England and the Canadian maritime provinces, followed on the 16th by winds changing to west and northwest, with clearing weather but falling barometer, as the central depression passed eastward to the Gulf of Saint Lawrence. During the day depression passed eastward over Newfoundland, followed by winds shifting to southwest and northwest, with rapidly rising barometer. 17th, depression central in about 50° N., 45° W.; in 44° 53′ N., 51° 04′ W., WSW. to WNW., fresh to strong gales, hard squalls, high sea; in 43° 12′ N., 57° 39′ W., strong NW. gales, hard squalls, heavy sea; in 43° 46′ N., 54° 22′ W., W. strong heavy hail squalls, high sea; in 53° 40′ N., 29° 50′ W., barometer 29.43, wind S., force 6, cloudy. 18th, depression about stationary; in 49° 06′ N., 31° 54′ W., westerly gales, stormy, high sea; in 48° 07′ N., 34° 44′ W., W. to N., moderate gale, heavy head sea; in 48° 21′ N., 39° 08′ W., moderate gale, heavy head sea. On the following day the depression moved very slowly northward combining on the 22d with area No. XX then central southwest of Iceland. On the 21st a trough of low pressure extended from Iceland southwestward to Newfoundland embracing the supposed centers of areas No. XII and No. XX. No. XIV.—This area developed on the North Carolina coast as a subsidiary depression during the passage northeastward of area No. XII on the 14th. During the day it passed northeastward along the Middle Atlantic and New England coasts accompanied by northeasterly gales and rain and on the 15th became central off the southern coast of Maine, lowest barometer at Eastport 29.52, a fall of 1.19 inches in past twenty-four hours. On this day the two areas, Nos. XII and XIV, moved in parallel courses northeastward, the former being central in the Lower Saint Lawrence Valley. On the 16th the two areas combined in the Gulf of Saint Lawrence, followed over New England and in the western portion of the Canadian maritime provinces with clear or partly cloudy weather and occasional snow. In the eastern portion of the latter region, stormy weather still prevailed; lowest barometer at Saint John's and Saint Pierre, Newfoundland, 29.14 and 29.12, respectively, winds W.; Sidney, N. S., 29.26, SW. Severe southwest to northwest gales with heavy sea were experienced over the ocean north of parallel 40° N. and between the meridians of 50° and 70° W. No. XVI.—Following the passage southeastward of an area of 30.40 from the Saskatchewan Valley, the barometer on the 15th fell quite suddenly over the northern Rocky Mountain region accompanied by southeast to southwest winds, light rain, and snow. During the day this depression passed southeastward into Nebraska, where it was central on the morning of the 16th. On this day heavy westerly winds with snow were experienced in the central Rocky Mountain region: Pike's Peak, W. 62 miles; Cheyenne, W. 50 and Virginia City, W., 32. During the day the depression passed eastward with great rapidity, but diminishing energy, over the Lake region to New England, being central in the latter district on the morning of the 17th. By the following morning the central area passed off the Nova Scotia coast, losing its identity in an extensive area of 29.80 prevailing over the ocean from Greenland southward to parallel 40° N. and thence southeastward to near the Cape Verde Islands. No. XVIII.—This area developed on the 17th over the Middle Plateau, forming an irregular elongated area of about 29.90, running from northern Montana southward to northern Arizona and thence southeastward down the valley of the Rio Grande. By morning of the 18th this large and irregular depression was considerably contracted by the descent southward of a high pressure area, 30.30, which cut off its eastern extremity and confined the central area to the region of its incipient stages. The area was now inclosed by the isobar of 29.80 and accompanied by northerly winds and snow on its northern border. During the 18th the depression lost its identity owing to the rapid advance of area No. XIX moving eastward from the Middle Pacific coast. No. XIX.—On the 18th while area No. XVIII covered the Middle Plateau the pressure began to diminish along the California coast so that by the following morning an area of 29.60 (lowest barometer at Sacramento, 29.58, a fall of 0.40 inch) embraced the northern portion of the State. An elongated area of 29.80 extended from the Middle Pacific coast eastward to the Lower Missouri Valley. On the 20th the depression was central in the Middle Plateau, lowest barometer at Winnemucca, 29.50, S., light rain. 21st, central in Wyoming, lowest barometer at Cheyenne, 29.45, a fall of 0.17 inch. On this day the area of 29.80 extended from British Columbia southeastward to Texas. 22d, central with diminished energy over Lake Huron. The area of precipitation covered the entire Lake region and thence eastward to the Atlantic. During the day this depression rapidly dissipated over Canada, under the influence of two areas of high pressure, 30.60 covering the western portion of the Canadian maritime provinces and 30.30 in the Lower Missouri Valley. No XX.—This depression appeared on the 19th in the southern portion of the Upper Lake region and moved rapidly northeastward over the Lower Lakes, accompanied by rain or snow and fresh to brisk southwesterly winds. During the 20th passed southward off the Novia Scotia coast, and then again to the northeast, being central on the 21st with greatly increased energy in the vicinity of 50° N., 50° W. 21st, in 48° 50′ N., 46° 40′ W., 29.36, SW., force 6, heavy sea, threatening; in 46° 58′ N., 45° 55′ W., heavy westerly gales, with violent squalls; in 45° 21′ N., 44° 30′ W., strong SW. to W. gales, high sea; in 49° 29′ N., 35° 32′ W., W. and SW. strong gales, squally, heavy head sea; in 49° 33′ N., 32° 36′ W. NW. strong, snow and hail squalls, high W. sea; in 51° 08′ N., 48° 30′ W. NE. to NW. moderate gale. During the21st depression passed rapidly northeastward, being central on the 22d in about 60° N., 30 W. Although the central area of low on this day was situated far to the north, yet the influence of the depression was still evident southward to parallel 45° N., as shown by the following reports, where the violence exhibited is largely due to the advance eastward of an area of 30.60 over the Gulf of Saint Lawrence. In 45° 30′ N., 50° 18′ W., WNW. heavy gale, dense snow squalls; in 48° 34′ N., 37° 33′ W., rain and hail, with high westerly winds; in 48° 29′ N., 39° 43′ W., NW. and W. hard gale, very heavy head sea; in 44° N., 47° 49′ W., strong W. and SW. gales, with very high sea. During the approach and passage of the storm the following observations were made at Stykkisholm, Iceland; 20th, 29.60, S.; 21st, 29.15, E.; 22d, 29.39, E.; 23d, 28.85, SE., rain and hail; 24th, 29.50, NE., cloudy. After rounding Iceland to the northward, the depression was central on the 24th over the ocean northwest of Norway; Tromso, 29.04, SW., cloudy; Brono, 29.27, SW., rain; Thorshavn, 29.35, W., force 6. 25th, depression central east of the White Sea; Archangel, 28.85, a fall of 0.18 inch, NW., snow; over central Russia the winds shifted to southwest with rapidly falling pressure and snow. 26th, central in eastern Russia; Kasan, 29.31, SW., cloudy; Ekaterinburg, 29.45, WSW., cloudy. 27th, central northeast of the Caspian Sea; over central and eastern Russia winds shifted to north and northeast with rising barometer and snow; lowest barometer at Astrakhan, 29.79, a fall of 0.12 inch, NE., cloudy. During the day depression disappeared in a high pressure area prevailing over Toorkistan. No. XXI.—This depression first appeared to the northwest of Hudson's Bay on the 18th, when the barometer at York Factory fell from 30.17 to 29.99, and the wind shifted from east to southeast. 19th, depression central north of York Factory, barometer, 29.50, S., snow; 20th, 29.67, SW., clearing. It is rather difficult to trace the course of the depression after the 19th, owing to the entire absence of reports over that portion of North America north of parallel 60° N. But the influence exerted upon the surrounding pressure at Gadthaab, Greenland, appears to be of such a nature and degree that it would seem a safe judgment to trace the area as indicated upon the chart. The following observations were made at Godthaab: 18th, 29.34, ENE.; 19th, 29.22, ENE.; 20th, 29.09, calm; 21st, 29.17, SE.; 22d, 29.30, ENE.; 23d, 29.75, NW. On the 23d this depression combined with area No. XX, then central off the western coast of Iceland. No. XXIV.—While area No. XIX was central in Wyoming and before a complete recovery of pressure took place over the Middle Plateau, the barometer began again to fall and by the morning of the 22d an area of 29.60 was central in Utah. During the day the depression moved southeastward into Arizona; the area of 29.80 extended from Montana southward to Mexico and thence eastward along parallel 30° N. to central Texas. Owing to the rapid descent of a high-pressure area 30.80 from the British possessions the depression disappeared in northern New Mexico during the 23d. No. XXV.—This depression of slight energy appeared off the Middle Atlantic coast on the 22d, forming as a subsidiary area to No. XIX, then central in the Upper Lake region. During the day it moved rapidly northeastward along the coast accompanied by northeasterly gales and rain, 23d, central south of Newfoundland; lowest barometer at Saint Pierre, N. F., 29.83, wind, S., force 5, stormy; in 44° 05′ N., 55° 40′ W., 29.98, SSE., force 6, rain. During the day disappeared in a high-pressure area, 30.40, prevailing near 40° N., 50° W. No. XXVII.—This area appeared in central Texas on the 23d, resulting in part from the division of the elongated depression of 29.80 which marked the peculiar of area No. XXIV on this day. The division of this depression by the descent of a high pressure area as heretofore noted in the description of area No. XXIV was instrumental in the rapid movement northeastward of area No. XXVII, which by morning of the 24th was central over the Lower Lakes, accompanied by heavy precipitation. During the day it moved down the valley of the Saint Lawrence, being central on the morning of the 25th over Newfoundland, thereafter combining with area No. XXIX, which had approached northeastward from the northern portion of the Middle Atlantic States. No. XXIX.—This area appeared over southern New England on the 24th, while area No. XXVII was central in the Lower Lake region. During the day it moved rapidly northeastward to Newfoundland, where it was central morning of the 25th. Saint Pierre, Newfoundland, 29.49, a fall of 0.71 inch, wind shifted from NW. to SW.; Saint John's, Newfoundland, 29.56, a fall of 0.46 inch, wind shifted from NW. to S., with rain. During the day the depression passed eastward to about 50° N., 40° W., where it was central on the 26th; in 40° 45′ N., 38° 20′ W., 29.43 NW., force 5, drizzling; in 41° 40′ N., 54° 10′ W., NNE., force 4, rain; in 51° 26′ N., 36° 42′ W., 28.81, a fall of 0.72 inch, WSW., force 10, very heavy sea, cloudy; 49° 04′ N., 42° W., strong westerly gales throughout the day; in 49° 32′ N., 36° 58′ W., very heavy west gales with dangerous sea; in 47° 39′ N., 35° 47′ W., W. to NW. strong gale, high sea; in 48° 13′ N., 33° 47′ W., WNW. gale, high sea, heavy rain, and violent squalls. As the depression passed northeastward to Iceland, very heavy W. to NW. gales, with snow squalls, prevailed over the ocean between 45° and 60° N., and 25° and 45° W. 27th, depression central over Iceland, with greatly increased energy, and very sharp barometric gradients, southward to the British Isles. The area of 29.60 extended from 50° N., 40° W. northeastward to Norway, covering the northern portion of the British Isles. Over the latter the southerly winds had increased to gales, with velocities ranging from 25 to 60 miles per hour, and accompanied by fierce squalls of rain and snow; the barometer fell from 0.25 to 0.60 inch in past twenty-four hours. The following observations were reported from Stykkisholm: 24th, 29.50, NE., force 6; 25th, 29.31, SE., force 8, rain; 26th, 29.00, SW., force 6, snow squalls; 27th, 27.98, calm, the lowest barometer reading of the month, and also for a period many years, at this station; 28th, 28.62, NE., force 7, snow squalls; 29th, 29.08, E., force 8. In 47° 06′ N., 45° 50′ W., strong WNW. gale throughout the day, with thick snow squalls and hard frosts at night; in 48° 24′ N., 41° 27′ W., heavy westerly gale and high sea; in 57° N., 19° W., hurricane from SW. to NW., with frightful sea; steamship Silesia, from Hamburg to New York, when about 600 miles west of Queenstown, experienced tremendous hurricane from 27th to 31st; in 50° 54′ N., 26° 23′ W., SW. to WNW, moderate gale, high sea; in 51° 22′ N., 20° 30′ W., SW., and W. strong gales, hard squalls. 28th, depression central north-northeast of the Faroe Islands; Thorshavn, 29.04, W., force 6; North Unst, 29.23 W., force 8; Sandwick Manse, 29.42, SW., 24 miles, rain; Valencia, 29.71, SSW., 52 miles, rain; Brono, 28.98, a fall of 1.02 inches, SW., rain and snow; Tromso, 28.93, a fall of 0.89 inch, SW., fair; Christiania, 29.46, a fall of 0.98 inch, S., cloudy; Hernosand, 29.44, a fall of 0.93 inch, S., cloudy. The area of precipitation extended southward from parallel 70° N. to parallel 45° N. and between the meridians of 30° E. and 10° W. As the depression passed eastward the pressure rose slightly over the Faroe Islands with winds shifting to NW., but over the Shetland and Orkney Islands it fell considerably with steady westerly winds. 29th, depression central in northern Scandinavia: Brono, 28.74, S., snow; Tromso, 28.73, SW., cloudy; Christiania, 29.06, WSW., threatening; Bergen, 29.35, WSW., 1.17 inches, rain-fall in past twenty-four hours. The lowest pressures on this day were reported from northern Sweden: Hernosand, 28.69, calm, cloudy; Umea, 28.80, S., cloudy; Upsala, 28.80, SW., cloudy; Stockholm, 28.95, N. W., cloudy; Haparanda, 29.06, SE., cloudy. The area of precipitation now moved eastward into central Russia, with winds shifting to south and southeast. During the day the depression moved slowly northward with diminished energy. The further progress of the area eastward was prevented by the exceedingly high pressures over central Siberia (30.80) and western Russia (30.40.) 30th, Tromso, 28.77, a rise of 0.04 inch, SW.; Brono, 28.88, a rise of 0.14 inch, SW., rain and snow; Haparanda, 28.98, a fall of 0.08 inch, calm; Umea, 29.03, a rise of 0.23 inch, SW., cloudy; Hernosand, 29.06, a rise of 0.37 inch, SW., clear; Archangel, 29.41, a fall of 0.26 inch, ESE., cloudy. 31st, central with greatly diminished energy over northern Lapland; Tromso, 28.91, SW., fair; Haparanda, 29.13, SSE., fair; Archangel, 29.52, ESE., cloudy. During the day the depression gradually filled up in the vicinity of parallel 70° N. This storm proved to be the most violent of the month and was accompanied by the lowest barometric readings. No. XXX.—For four days previous to the appearance of this depression the barometer had been high in the northwest and Saskatchewan Valley, ranging from 30.20 to 30.80, but by morning of the 26th a small area of 29.80 appeared in northern Dakota, accompanied by southerly winds and occasional light rains. 27th, central in the Upper Missouri Valley, with heavy gales to the south and west: Pike's Peak, SW., 56; Dodge City, SW., 45; Cheyenne, W., 44 miles. 28th, central in the Lower Missouri Valley, Leavenworth barometer 0.70 inch below the normal. During the day the depression moved rapidly northeastward in a narrow barometric trough over the Upper Mississippi Valley to the Lower Lakes, where it was central morning of the 29th. During the day it moved rapidly northeastward down the Saint Lawrence Valley, being central on the morning of the 30th, northeast of Newfoundland. 30th, in 49° 35′ N., 46° 20′ W., 29.39, a fall of 0.90 inch, SW., heavy gales with rain; in 47° 50′ N., 48° 30′ W., 29.66, a fall of 0.64 inch, SW., heavy gales, threatening. During the day the depression passed rapidly northeastward south of Iceland, and on the morning of the 31st was central just west of the Faroe Islands with a barometric trough of 29.00 extending southwestward from northwestern Norway over Iceland to near 50° N., 40° W. The following observations were reported from Stykkisholm, Iceland, during the approach and passage of the storm: 19th, 29.08, E., force 8; 30th, 28.90, E., force 6; 31st, 28.86, E., force 2; January 1, 28.39, NE., force 6, snow; 2d, 29.21, N., force 8, snow. It will be observed at the commencement of these observations that the pressure at Stykkisholm had recovered from the extraordinary influence of area No. XXIX. Thorshavn, 29th, 29.16, NW., force 2; 30th, 28.95, SE., force 6; 31st, 29.09, SW., force 2; January 1, 28.64, S., force 6, rain. North Unst, 29th, 29.07, W., force 7; 30th, 29.17, SE., force 6; 31st, 29.19, W., force 7. The further course of this depression will appear on the January chart, 1880. No. XXXI.—This depression of slight energy first appeared in the Northern Plateau district on the 28th, while area No. XXX was central in the Lower Missouri Valley. 29th, central in the Middle Plateau, lowest pressure at Salt Lake City, 29.77, calm, light snow. Southerly winds with light rain prevailed in western Arizona and northerly winds with light snow in Colorado and Wyoming. By morning of the 30th the depression had disappeared in an area of high pressure, 30.20, over New Mexico, which increased to 30.40 to the east and northeast. No. XXXII.—This area appeared morning of the 30th in the Saskatchewan Valley, and during the day moved thence southeastward to Lake Superior, being central to the northward on the 31st. The depression as yet displayed but slight energy, owing probably to the very high pressures to the south and east, 30.40, in the Middle slope and Lower Missouri Valley, and 30.70 in the Middle Atlantic States, New England, and Lower Saint Lawrence Valley, The further course of this area will appear on the January chart, 1880. No. XXXIV.—This area advanced from the Pacific Ocean in parallel 50° N., and was central over British Columbia on the 31st. Its further course will probaby appear on the January chart, 1880. Of the storms forming over the Atlantic Ocean but one has been traced for the present month, concerning which the following brief description is given: No. III.—This area apparently resulted from a slight depression which on the 29th and 30th of November occupied the ocean south of parallel 40° N., and between the meridians of 30° and 50° W. On December 1 the barometer at Angra read 29.50, a fall of 0.38 inch, wind shifted from E. to W., 0.80 inches rainfall in past twenty-four hours; Ponta Delgado, 29.57, a fall of 0.49 inch, wind shifted from ESE. to SW., 1.60 inches rainfall in past twenty-four hours. 2d, depression central in about 45° N., 15° W., thereafter pursuing a southeasterly course to the northwestern coast of Spain, where, on the morning of the 3d, it was central with greatly increased energy. On this day the lowest barometer reported occurred at Santiago, 28.81, a fall of 1.24 inches in past 48 hours, or of 0.84 inch in past twenty-four hours, wind SSW., stormy; 1.23 inches rainfall in past twenty-four hours. Lisbon, 29.20, a fall of 0.52 inch, SW., 40 miles, 0.70 inch rainfall in past twenty-four hours. Pressure over Spain fell generally from 0.20 to 0.80 inch. During the day the depression curved to the northeast with slowly diminishing energy, being central morning of the 4th on the western coast of France: Tours, 29.08, a fall of 0.57 inch, E., stormy; Rochefort, 29.06, a fall of 0.41 inch, S., cloudy; Bourges, 29.09, a fall of 0.65 inch, SSE., cloudy; Lorient, 29.00, a fall of 0.48 inch, NE., force 8, cloudy. On this day ten stations in France reported snow with northeasterly winds; the winds throughout that country were generally from NE. to SE., with the barometer ranging from 29.00 to 29.60. During the day the depression moved rapidly eastward along parallel 50° N. and by morning of the 5th was central in southern Germany; lowest barometer at Leipsic, 29.31, a fall of 0.45 inch, ENE., heavy snow. Violent northeast to southeast and westerly gales with snow prevailed throughout Germany. Southeast to southwest and northwest winds with rain prevailed throughout Austria and Hungary. 6th, depression central north of the Black Sea; Lugan, 29.35, a fall of 0.19 inch, ESE., cloudy; Nikolaiev, 29.56, N., cloudy; Kieff, 29.58, NE., cloudy. 7th, gradually disappeared in a high pressure area over the Caspian Sea. Concerning the storms in Europe the following descriptions are given: No. IV.—This area is traced as a continuation of No. XXIV of the November chart. Central morning of the 1st in Hungary; lowest barometer at Pola, 29.30, E., force 6, rain; snow was reported, with northeasterly winds, from Szathmar and Trieste, and with a west wind from Agram. On this day a narrow barometric trough, of 29.50, extended from the eastern extremity of the Black Sea westward to include northern Italy. 2d, depression central north of the Black Sea; Lugan, 29.43, SSW., cloudy; Nikolaiev, 29.30, SW. rain; Kieff, 29.34, NE. snow. During the day the depression passed rapidly northeastward, and on the morning of the 3d was central in about 55° N., 55° E.; Kasan, 29.14, a fall of 0.87 inch, SW. cloudy; Krotkowo, 29.33, a fall of 0.60 inch, SW., cloudy; Ekaterinburg, 29.20, a rise of 0.18 inch, SSE., snow: Archangel, 29.66, a fall of 0.40 inch, NE. cloudy. 4th, depression central east of the White Sea; Archangel, 29.14, NE., snow; Kasan, 29.73, SSW., fair; Ekaterinburg, 29.35, WSW., fair; 5th, depression about stationary; Archangel, 29.58, N., fair; Kasan, 29.73, S., fair; Ekaterinburg, 29.87, SW., fair. During the 6th and 7th the depression passed slowly eastward to the valley of the Yenisei; on the 6th there was a fall of 0.41 inch at Barnaul, and on the 7th of 0.65 inch at Yeniseisk, wind SE., snow; wind shifted to SW., with snow at Barnaul. 8th, depression probably disappeared in an area of high pressure (30.30) over southern Siberia. No. V.—This depression is a continuation of area No. XXVII of the November chart. Central on the 1st in the valley of the Obi, it was accompanied by easterly winds and snow. 2d, central in the valley of the Yenisei, with rapidly diminishing energy and during the day disappeared in an area of 30.30 in central Siberia. No. XIII.—This depression formed over Lapland on the 13th as the result of an elongated area of barometric minima extending from southern Greenland northeastward to northern Scandinavia, accompanying the advancement of area No. IX then central west of Iceland. 13th, Tromso, 29.48, a fall of 0.42 inch, SW., cloudy, 1.10 inches rainfall in past twenty-four hours; Haparanda, 29.50, a fall of 0.78 inch, SE., cloudy; Archangel, 29.43, a fall of 0.92 inch, SSW., heavy snow drift. 14th, depression central in about 60° N., 60° E.; Archangel, 29.70, WNW., cloudy; Kasan, 29.88, a fall of 0.50 inch, WSW., snow; Ekaterinburg, 29.55, a fall of 0.82 inch, SW., cloudy. 15th, central in about 60° N., 80° E.; Ekaterinburg, 29.86, W., fair; Barnaul, 29.69, fall of 0.15 inch, NW., snow; Yeniseisk, 29.86, a fall of 0.37 inch, clear. By morning of the 16th the depression had lost its identity owing to the rapid advance and superior energy of area No. IX, then central near the White Sea. On this day the barometer rose rapidly to 30.10 at Yeniseisk and 30.21 at Barnaul. No. XVII.—This depression appeared on the 17th over the White Sea as an auxiliary area to No. IX then central in the valley of the Obi. On that day a narrow barometric trough of 29.00 ran southeastward from Lapland, inclosing the center of area No. XVII, while the isobar of 29.40 inclosed that of area No. IX. 17th, Archangel, 29.88, a fall of 0.36 inch, SW., cloudy. 18th, depressions central in about 60° N., 60° E.; Archangel, 29.57, NW., fair; Kasan, 29.25, a fall of 0.46 inch, NW., fair; Ekaterinburg, 29.16, a fall of 0.18 inch, SW., cloudy. 19, central in the valley of the Obi, with diminishing energy; Ekaterinburg, 29.51, W., fair. 20th and 21st, depression about stationary but with decreasing pressure, finally disappearing east of the Yenisei on the 22d. This depression probably reached the Asiatic coast, as the pressure on the following day was below 29.70 eastward to Nikolaievsk on the Amoor. No. XXVI.—This depression of slight energy appeared north of the Caspian Sea on the 22d; Krotkowo, 29.80, N., light snow; Kasan, 29.82, NNW., cloudy; Ekaterinburg, 29.63, calm, cloudy. 23d, central in about 55° N., 75° E.; Ekaterinburg, 29.91, NW., clear; Barnaul, 29.69, a fall of 0.25 inch, SE., snow; Tashkend, 29.94, a fall of 0.12 inch, wind shifted from N. to W. 24th, passed eastward south of Yeniseisk, barometer 29.70, a fall of 0.17 inch, W., cloudy; Barnaul, 29.82, a rise of 0.13 inch, SW., cloudy. By morning of the 25th had disappeared in an area of 30.30 over southern Siberia. Concerning the storms off the Asiatic coast, the following descriptions are given: No. VII.—This depression first appeared south of the Island of Formosa and moved thence northwestward, being central on the 6th near the Island of Kinsin; Nagasaki, 29.88, a fall of 0.14 inch, wind shifted from N. to S., with heavy rain; in 28° 27′ N., 127° 18′ E., 30.08, NNW., heavy gale, high sea; Hiroshima, 29.76, a fall of 0.28 inch, wind shifted from NNE. to SW., gloomy weather; Tokei, 29.87, a fall of 0.29 inch, wind shifted from NNE. to NNW., cloudy, 0.88 inch rainfall in past twenty-four hours; Wakayama, 29.73, a fall of 0.29 inch, wind shifted from NE. to SE. 7th, depression probably central off the northeastern coast of the Island of Nippon; lowest barometer at Tokei, 29.60, a fall of 0.27 inch, SW., clear; Yokohama, 29.65, a fall of 0.27 inch, W., clear; Wakayama, 29.84, W., clear; Hiroshima, 29.88, W., rain; Nagasaki, 30.10, W., rain. During the day the depression disappeared to the eastward over the ocean, followed morning of the 8th by clear weather and rising pressure at all stations. No. XV.—On the 14th the barometer at Nagasaki fell from 0.15 to 0.20 inch, followed on the morning of the 15th by winds shifting from W. to NW., with heavy rain. The pressure at most Japanese stations had fallen from 0.10 to 0.15 inch, with northeasterly winds. 16th, depression probably central off the southeastern coast of Nippon; Tokei, 29.72, a fall of 0.37 inch, NW., rain, 1.73 inches rainfall in past twenty-four hours; at other Japanese stations the barometer rose from 0.01 to 0.23 inch, with clearing weather and winds shifting to northwesterly. This depression was too far south of the coast to produce decided effect at land stations. No. XXII.—On the 18th the barometer at all Japanese stations fell from 0.06 to 0.21 inch, followed on the 19th by winds shifting to easterly, with cloudy weather and rain. By morning of the 20th the depression passed eastward south of Tokei, the barometer at that station having fallen 0.24 inch, wind shifting from NE. to NNW., with clearing weather. The barometer at other stations, except Wakayama, rose from 0.07 to 0.11 inch, with winds shifting to northeasterly. No. XXIII.—The presence of this depression to the southwestward was forestalled on the 20th at western stations by the shifting of the winds from northwest to northeast, with slowly rising pressure, while at Wakayama, Yokohama, and Tokei (eastern stations) the winds shifted from northeast to northwest, with falling pressure under the influence of departing area No. XXII. By morning of the 21st the barometer at all Japanese stations had fallen from 0.02 to 0.12 inch, with northeast to northwest winds and light rain at Nagasaki. 22d, lowest barometer at Tokei, 29.69, a fall of but 0.01 inch, NNW., clear. Nagasaki remained stationary, while the barometer at other stations fell from 0.03 to 0.04 inch; the winds at all stations shifted to northerly with clear or fair weather. By morning of the 23d the barometer at all stations except Nagasaki, had risen from 0.04 to 0.10 inch, with winds shifting to northwesterly; the probable position of the area was indicated by the following ship's report: in 37° 10′ N., 161° 32′ E., 29.54, NW., force 4 to 6, high westerly gales, heavy sea and rain. This depression was too far south to produce decided effect at land stations. No. XXVIII.—The position of this depression as charted on the 23d is very much in doubt, although the southeasterly winds, with falling pressure at Manilla would probably indicate its presence south of the Island of Formosa. By morning of the 24th the barometer at Nagasaki had fallen slightly, wind changed from WNW. to calm. At Hiroshima the barometer fell 0.02 inch, wind NNE., clear; Tokei, rose 0.04 inch, wind shifted from NNW. to NE.; Wakayama, rose 0.01 inch, wind continued from the E. 25th, Hiroshima, barometer stationary, wind shifted from NNE. to NNW., light rain; Nagasaki, rose 0.08 inch, wind N.; Tokei, 29.55, a fall of 0.38 inch, wind shifted from NE. to SSW.; Wakayama, fell 0.16 inch, wind shifted from E. to NNW., light rain. By morning of the 26th the barometer at Japanese stations had risen from 0.15 to 0.58 inch, winds shifting to northeasterly. with clear or fair weather. On this day the depression was probably central in about 37° N. 150° E., as shown by the following ship's report: in 35° 50′ N., 150° 24′ E., 29.35, SSW., force 7, high southwesterly sea, heavy rain. This vessel, on the 25th, in 36° 10′ N., 154° 57′ E., reported a barometer of 30.08, wind SW., force 4; in moving east about 4° she experienced a fall in pressure 0.73 inch, with wind increasing to a gale. The probable position of the depression on the 27th is again indicated by the ship's report as follows: in 35° 48′ N., 148° 09′ E., 29.48, N., force 9, high north sea, heavy rain. 28th, in 25° 22′ N., 145° 55′ E., 29.85, N., force 6, high NNW. sea, heavy rain. No. XXXIII.—By morning of the 28th the barometer at Nagasaki had fallen from 30.09 to 29.86, wind shifted from SE. to WNW., with light rain. At Hiroshima the barometer had fallen 0.43 inch, wind shifted from NNE. to ESE., with rain; Tokei, fell 0.23 inch, wind shifted from ESE. to NNE., with moderately heavy rain; Wakayama, fell 0.48 inch, wind shifted from NNW. to E., with moderately heavy rain. 29th, Tokei, 29.34, a fall of 0.65 inch, SSE., cloudy; Wakayama, 29.56, a fall of 0.16 inch, NW., fair; Hiroshima, 29.73, a fall of 0.03 inch, W., cloudy; Nagasaki, 29.97, a rise of 0.11 inch, NW., cloudy; in 34° 53′ N., 142° 55′ E., 29.41, SSW., force 6, high west sea, cloudy. 30th, Tokei, 29.32, a fall of 0.02 inch, SW., clear; Wakayma, 29.67, a rise of 0.11 inch, WNW., cloudy; Hiroshima, 29.81, a rise of 0.08 inch, WNW., cloudy; Nagasaki, 29.98, a rise of 0.01 inch, WNW., rain; in 35° 02′ N., 140° 42′ E., 29.30, WNW., force 6, high west sea, rain squalls. 31st, the barometer at all Japanese stations rose from 0.11 to 0.24 inch, winds shifted from SW. and WNW. to N. and NNE., with clear or partly cloudy weather; lowest barometer at Yokohama, 29.42, rising on the following day to 29.90, wind W. During the day the depression disappeared to the eastward over the ocean.

TEMPERATURE OF THE AIR.

The mean temperature of the air for November, 1881, is shown by the isothermal lines (in red) on Chart No. II. The table of mean and comparative temperatures in the right hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. East of the 97th meridian the temperature is everywhere above the normal, except in Minnesota and the Western Gulf States, the departures of excess ranging in the extremes from 0°.7 in the Missouri Valley to 5°.6 in the Florida Peninsula. The Western Gulf States report a normal condition, while Minnesota shows a deficiency of 1°.1. Westward to the Pacific the temperature is everywhere below the normal, except in the Northern Rocky Mountain slope, where there is an excess of 0°.7. Throughout this extensive stretch of territory the departures of deficiency range in the extremes from 0°.4 in the Middle Rocky Mountain slope to 2°.4 in the Middle Pacific Coast region. Larger deficiencies were reported from isolated stations, 4°.5 at Salt Lake City and 3°.1 on the summit of Pike's Peak. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1872, together with the corresponding districts: 1873, —7°.0 New England and —5°.5 Minnesota; 1874, +4°.8 Gulf States and +3°.9 Ohio Valley and Tennessee; 1875, —6°.0 St. Lawrence Valley, —5°.3 Minnesota and +5°.7 Gulf States; 1876, —4°.5 Lower Missouri Valley, and +3°.1 Lower Lake re-gion; 1877, +7°.3 Minnesota, and +6°.1 New England; 1878, +13°.7 Upper Missouri Valley, and +12°.4 Minnesota; 1879, +5°.1 Western Gulf States and +4°.6 Ohio Valley and Tennessee; 1880, —12°.4 Rio Grande Valley and —11°.3 Southeast Rocky Mountain slope.



Deviations from mean temperature.—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of Chart No. II. The following items of importance in connection with this subject are reported by voluntary observers: *Illinois:* Riley, mean temperature 0°.5 above that for the past twenty years; mean temperature of autumn of 1881, 3°.5 higher than the average of this season for the past twenty years; only the years 1865 and 1870 were warmer than 1881, while the mean of 1867 was just equal. *Kansas:* Lawrence, mean temperature, 1°.56 above the mean of past three years. Yates Centre, mean temperature 11°.5 above that of 1880. Wellington, mean temperature 3°.05 above the average for past two years. *Maine:* Gardiner, mean temperature 1°.52 above the mean of the past forty-five years. *Maryland:* Fallston, mean temperature 4°.8 above the mean of the past ten years. *Missouri:* Saint Louis, Missouri Weather

Service reports the mean temperature 0°.4 above the mean of the past forty-five years. *New Hampshire:* Contoocookville, mean temperature 38°.5 or 4°.5 above the mean of past ten years. *New Jersey:* Newark, mean temperature 2°.73 above the average for the past thirty-eight years; highest mean, 49°.7 in 1849; lowest mean, 36°.1, 1873; mean temperature of autumn 5°.3 above the average of the past thirty-eight years; warmest autumn 56°.32 occurred in 1850; coldest autumn 50.77 occurred in 1875. *New York:* North Volney, mean temperature 2°.8 above that of the past thirteen years; highest monthly mean, 38°.8, occurred in 1877; the lowest, 29°.5, occurred in 1873; mean temperature of autumn 4°.54 above the mean of this season for past thirteen years; the autumn of 1881 has been the warmest on record. Palermo, mean temperature, 1°.3 below that of the past twenty-eight years; warmest November, temperature 41°.8 occurred in 1859; coldest November, temperature 26°.8 occurred in 1873. Waterburgh, mean temperature, 4°.61 above the mean of the past ten years. *Ohio:* North Lewisburgh, mean temperature 12°.5 above that of 1880 and 2°.6 above the mean of the past fifty years. Cleveland, mean temperature 11°.27 above that for 1880 and 2°.6 above the mean of the past twenty-seven years; highest mean during that period 44°.53 occurred in 1859; lowest mean 31°.91 occurred in 1880. *Virginia:* Wytheville, the following report is made by Mr. Howard Shriver, voluntary observer: "Like the four preceding months, November has been warmer than the average. Not only so, but its average temperature has been higher and it hence may be regarded as a warmer month than any November in the past seventeen years, by values varying from 1° to 9°. As might be expected, its warmest day showed a higher marking than any day of the previous seventeen Novembers, with one exception, in the year 1879, when the mercury rose 6° higher than any day of the present month. It seems strange, in this connection, to find that only three (1872, 1873, and 1879) of the preceding Novembers had colder days than the present month." *West Virginia:* Helvetia, mean temperature 9°.11 above that for 1880 and 4°.01 above the mean of the past five years.

Table of maximum and minimum temperatures for November, 1881.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Mobile	81		Auburn		19
Do	Montgomery		25			
Arizona	Yuma	83		Maricopa	96	
Do	Prescott		12			
Arkansas	Little Rock	71	25	Mount Ida	80	16
California	Campo	79	16	Indio	85	
Do				Summit		1
Colorado	Denver	66				
Do	Pike's Peak		—12			
Connecticut	New Haven	66	17	Southington	70	13
Dakota	Fort Sully	68		Fort Randall	78	
Do	Fort Stevenson		—21	Fort Stevenson		—22
Delaware	Delaware Breakwater.	73	26			
District of Columbia	Washington	76	21	Receiving Reservoir.		20
Florida	Key West	88		Fort Barrancas		19
Do	Pensacola		28			
Georgia	Augusta and Savannah.	81		Quitman		28
Do	Atlanta		20			
Idaho	Fort Lapwai	64				
Do	Eagle Rock		—1			
Illinois	Cairo	72		Geneseo	75	
Do	Champaign		11	Elmira		3
Indiana	Indianapolis	63	10	Vevay	75	
Indian Territory	Fort Sill	75				
Do	Fort Supply		12			
Iowa	Keokuk	65		Cresco		—1
Do	Davenport					
Do	Dubuque and Des Moines.		6			
Kansas	Leavenworth	70	11	Fort Scott	76	
Kentucky	Louisville	74	19	Bowling Green	75	15
Louisiana	New Orleans and Port Eads.	80		Point Pleasant	81	
Do	Shreveport		23			
Maine	Portland	61		Dexter		—4
Do	Eastport					

Table of maximum and minimum temperatures for November, 1881—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Maryland	Baltimore	71	24	Federalsburgh and Woodstock.	77	
Do				Emmittsburgh		18
Massachusetts	Boston	71		Heath		4
Do	Springfield		13			
Michigan	Detroit	66		Lansing	67	
Do	Marquette		8	Fort Brady		—5
Minnesota	Saint Paul	57		Northfield	56	
Do	Saint Vincent		—18			
Mississippi	Vicksburg	80	25	Fayette		22
Missouri	Saint Louis	72	15	Sedalia	76	
Do				Oregon		4
Montana	Fort Benton	63		Fort Shaw		—19
Do	Fort Assinniboine and Fort Shaw.		—18			
Nebraska	North Platte	67	—5	Lincoln	74	
Nevada	Winnemucca	61	5	Golconda	85	
Do				Boca		—24
New Hampshire	Mount Washington	47	—15	Contoocookville	67	
New Jersey	Sandy Hook	73		Vineland	78	
Do	Atlantic City		22	Atco		19
New Mexico	La Mesilla	76		Fort Union		—5
Do	Silver City		13			
New York	Rochester	70		Fort Niagara	71	
Do	Oswego		13	Madison Barracks		—2
North Carolina	Wilmington	81		Highlands		8
Do	Charlotte		20			
Ohio	Columbus	72		Portsmouth	80	
Do	Cleveland	72	15	Bellefontaine		11
Oregon	Umatilla	70	20			
Pennsylvania	Pittsburgh	76		Dyberry		8
Do	Erie		17			
Rhode Island	New Shoreham	70				
Do	Newport		20			
South Carolina	Charleston	80	28	Aiken		22
Tennessee	Knoxville	81	15			
Texas	Uvalde	91				
Do	Mason		19			
Utah	Salt Lake City	56	13			
Vermont	Burlington	65	3	Charlotte	68	
Do				Newport		—7
Virginia	Cape Henry	79				
Do	Lynchburg		24			
Washington Territory	Almota and Pomeroy.	62				
Do	Spokane Falls		3			
West Virginia	Morgantown	76	26	Helvetia		14
Wisconsin	La Crosse	60	5	Manitowoc	63	
Do				Neillsville		—2
Wyoming	Cheyenne	56	9	Fort Fetterman	63	
Do				Fort Bridger		—7

Ranges of temperature at signal service stations.—Monthly ranges in general varied from 45° to 65° over the country east of the Rocky Mountains and from 35° to 55° westward to the Pacific. The smallest ranges were: San Francisco, 22°; Key West and Olympia, 25°; Red Bluff, 28°; Portland, Oreg., 29°; San Diego and Port Eads, 38°; Pike's Peak and Sacramento, 39°. The largest were: Rock Creek, Mont., 88°; Fort Sully, 79°; Fort Buford, 78°; Forts Stevenson and Benton, 77°; Bismarck, 76°; Fort Shaw, 75°; Helena, 72°; Fort Assinnaboine and Huron, 71°. The daily ranges varied in the different districts as follows: New England, 22° at New Shoreham to 34° at Boston and Eastport; Middle Atlantic States, 19° at Albany and 21° at Cape May to 29° at Lynchburg and 31° at Washington; South Atlantic States, 23° at Kittyhawk, Macon, Smithville, and Charleston to 30° at Augusta and Jacksonville; Florida Peninsula, 12° at Key West to 25° at Cedar Keys; East Gulf States, 21° at New Orleans to 31° at Vicksburgh, Mobile, Montgomery and Pensacola; West Gulf States, 21° at Port Eads to 38° at Denison and 39° at Mason; Rio Grande Valley, 35° at Laredo, Brackettville and Castroville to 38° at Uvalde; Ohio Valley and Tennessee, 23° at Columbus and 24° at Indianapolis to 32° at Knoxville and 38° Nashville; Lower Lake region, 22° at Oswego to 26° at Cleveland, Buffalo, and Rochester; Upper Lake region, 20° at Grand Haven and 24° at Port Huron to 30° at Duluth and 31° at Alpena; extreme Northwest, 41° at Moorehead to 48° at Bismarck and 52° at Fort Buford; Upper Mississippi Valley, 24° at Keokuk to 33° at Saint Louis and 37° at Saint Paul; Missouri Valley, 31° at Fort Bennett to 35° at Huron and 43° at Omaha; Southern Slope, 36° at Jacksborough to 46° at McKavett and 47° at Concho; Middle Slope, 40° at Dodge City to 42° at Denver; Northern Slope, 33° at Cheyenne to 41° at Fort Keogh and North Platte; Northern Plateau, 27° at Boise City to 32° at Missoula and 36° at Eagle Rock; Middle Plateau, 25° at Salt Lake City to 36° at Winnemucca; Southern Plateau, 40° at Silver City to 46° at La Mesilla and Phœnix and 48° at Tucson; South Pacific region, 30° at San Diego to 37° at Yuma and Los Angeles and 39° at Visalia; Middle Pacific region, 15° at San Francisco, to 28° at Sacramento and 34° at Red Bluff; North Pacific region, 18° at Olympia, to 21° at Portland and 22° at Roseburg.

Table of comparative minimum temperatures for the month of November.

State or Territory.	Minimum for November, 1881, Signal Service.		Lowest since Signal Service stations were opened—3 to 10 years.			Lowest from any other source.		
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Length of record.
		°		°			°	*Years.*
Alabama	Montgomery	25	Montgomery	26	'77, '80	Huntsville	18	9
Arizona	Prescott	12	Prescott	— 1	1880	Fort Whipple	— 1	9
Arkansas	Little Rock	25	Little Rock	10	1880	Fort Smith	6	21
California	Campo	16	Campo	17	1880	Fort Bidwell	9	11
Colorado	Pike's Peak	—12	Pike's Peak	—36	1880	Fort Garland	—35	30
Connecticut	New Haven	17	New Haven	2	1875	New Haven	2	87
						Colebrook	—10	18
Dakota	Fort Stevenson	—21	Pembina	—40	1874	Fort Buford	—37	16
Delaware	Delaware Breakwater	26	Delaware Breakwater	23	1880	Delaware City	13	4
District of Columbia	Washington	21	Washington	12	1880	Washington	12	49
Florida	Pensacola	28	Saint Mark's	27	1877	Fort Barrancas	19	59
Georgia	Atlanta	20	Atlanta	25	1880	Atlanta	10	7
Idaho	Eagle Rock	— 1	Lewiston	7	1880	Fort Hall	—12	4
Illinois	Champaign	11	Champaign	— 3	1880	Augusta	—12	19
Indiana	Indianapolis	10	Indianapolis	— 5	1880	Indianapolis	4	18
Indian Territory	Fort Supply	12	Fort Gibson	—10	1880	Fort Gibson	0	52
Iowa	Davenport, Dubuque and Des Moines.	6	Dubuque	— 9	1875	Independence	—17	18
Kansas	Leavenworth	11	Dodge City	— 7	1880	Fort Leavenworth	—14	51
Kentucky	Louisville	19	Louisville	8	1880	Newport Barracks	—23	80
Louisiana	Shreveport	23	Shreveport	18	1880	Fort Jessup	17	23
Maine	Eastport	3	Eastport	—13	1875	Orono	—16	12
						Brunswick	— 3	53
Maryland	Baltimore	24	Baltimore	15	1880	Emmittsburg	7	12
Massachusetts	Springfield	13	Boston	— 2	1875	Florida	—14	4
Michigan	Marquette	8	Marquette and Escanaba	— 9	'75, '80	Fort Brady	—17	59
Minnesota	Saint Vincent	—18	Duluth	—29	1875	Fort Ripley	—30	17
Mississippi	Vicksburgh	25	Vicksburgh	23	'77, '80	Columbus	22	10
Missouri	Saint Louis	15	Saint Louis	8	1880	North Springfield	— 9	1
						Allenton	— 5	4
						Jefferson Barracks	— 2	35
Montana	Fort Assinniboine and Fort Shaw.	—18	Fort Benton	—31	1875	Camp Baker	—42	9
Nebraska	North Platte	— 5	North Platte	—10	1877	Camp Sheridan	—17	6
Nevada	Winnemucca	5	Winnemucca	— 9	1880	Camp Halleck	—12	11
New Hampshire	Mount Washington	—15.5	Mount Washington	—40	1877	Grafton	—16	2
						Dartmouth College	— 9	18

Table of comparative minimum temperatures for the month of November—Continued.

State or Territory.	Minimum for November, 1881, Signal Service.		Lowest since Signal Servicestations were opened—3 to 10 years.			Lowest from any other source.		
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Length of record.
		°		°			°	*Years.*
New Jersey	Atlantic City	22	Atlantic City	10	1875	North Germantown	6	2
						Newark	8	88
New Mexico	Silver City	13	Santa Fé	—11	1880	Fort Union	—15	31
New York	Oswego	13	Albany	—10	1875	Canton	—20	2
						Gouverneur	17	40
North Carolina	Charlotte	20	Charlotte	18	1880	Fort Johnson	9	54
Ohio	Cleveland	15	Columbus	— 5	1880	Westerville	—13	9
						College Hill	— 2	68
Oregon	Umatilla	20	Umatilla	9	1880	Camp Harney	4	12
						Fort Dalles	4	16
Pennsylvania	Erie	17	Pittsburgh	4	1880	Franklin	— 8	8
						Philadelphia	12	113
						Allegheny Arsenal	4	31
Rhode Island	Newport	20	Newport	4	1875	Fort Adams	3	40
South Carolina	Charleston	28	Charleston	8	'77–'80	Aiken	23	8
						Charleston	28	105
Tennessee	Knoxville	15	Nashville	15	1880	Clarksville	— 3	8
Texas	Mason	19	Fort Elliott	— 5	1880	Fort Elliott	— 8	8
						Fort Richardson	8	10
Utah	Salt Lake City	13	Salt Lake City	3	1880	Coalville	—18	8
Vermont	Burlington	3	Burlington	—10	1875	Newport	—18	8
Virginia	Lynchburgh	24	Lynchburgh	13	1880	Snowville	9	8
						Fortress Monroe	15	56
Washington Territory	Spokane Falls	3	Dayton	8	1880	Fort Colville	— 8	20
West Virginia	Morgantown	26	Morgantown	8	1880	Helvetia	0	4
Wisconsin	La Crosse	5	Milwaukee	—14	1875	Neillsville	—26	8
						Fort Crawford	—13	25
Wyoming	Cheyenne	9	Cheyenne	—20	1875	Fort Bridger	—40	24

Frosts.—In the various districts they were reported on the following dates: New England, 2d, 4th, 5th, 7th, 10th, 11th, 12th, 14th, to 17th, 20th, to 30th; Middle Atlantic States, 1st to 7th, 9th, 30th; South Atlantic States, 2d, 4th, 5th, 13th, 14th, 16th, 17th, 20th, 21st, 24th to 29th; East Gulf States, 4th, 20th, 24th to 27th; West Gulf States, 3d, 4th, 6th, 9th, 12th to 15th, 20th, 21st, 24th to 28th; Rio Grande Valley, 25th; Ohio Valley and Tennessee, 2d to 6th, 9th, 10th, 12th to 17th, 19th to 30th; Lower Lake region, 1st, 2d, 5th, 6th, 7th, 10th, 11th, 12th, 14th to 17th, 19th to 29th; Upper Lake region, 2d to 7th, 9th to 30th; extreme Northwest, 1st to 5th, 8th to 30th; Upper Mississippi Valley, 1st, 3d to 30th; Missouri Valley, 1st to 6th, 8th, 9th, 10th, 12th to 15th, 19th to 28th; Northern Slope, 1st to 30th; Middle Slope, 2d to 5th, 7th to 28th, 30th; Southern Slope, 3d, 9th, 12th, 13th, 14th, 19th to 28th; Southern Plateau, 1st to 30th; Middle Plateau, 1st to 4th, 7th to 10th, 14th, 17th to 29th; Northern Plateau, 1st to 30th; North Pacific Coast region, 1st, 7th, 8th, 17th to 30th; Middle Pacific Coast region, 7th, 8th, 11th, 12th, 15th to 26th; South Pacific Coast region, 2d to 28th, 30th. Stations in the Southern States report the occurrence of damaging frosts as follows: *North Carolina:* Wilmington, 25th, first killing frost of season, weather intensely cold, thermometer falling to 26°. Highlands, 3d, first killing frost of season. Charlotte, 4th, first killing frost of season. *South Carolina:* Sumter, 25th, very heavy and damaging. Darlington, 25th, very heavy. Charleston, 25th, very heavy and damaging; all delicate plants left in the open air appeared as if scalded; 26th, killing frost. *Georgia:* Augusta, 24th, vegetation completely destroyed, ground froze hard and thick ice formed in places. Quitman, 25th, ice formed; vines killed. *Florida:* Pensacola, 4th, first frost of season. Mayport, 25th, first light frost of season. *Alabama:* Montgomery, 26th, first killing frost of season. Mobile, 25th, killing frost. *Mississippi:* Natchez, 4th, very heavy and destructive. *Louisiana:* New Orleans, 25th, first killing frost of the season; this damaging frost extended over nearly the whole of the State. *Texas:* Paris, 3d, very heavy frost, seriously damaging the cotton crop; first killing frost of the season. El Paso, 10th, first killing frost of the season. Concho, 25th, killing vegetation. Uvalde, 25th, killing vegetation. Brackettville, 25th, killing vegetation. *Indian Territory:* Fort Gibson, 20th, killing vegetation.

Ice.—Regarding its formation in the northern sections, this subject is considered elsewhere in the Review under the head of *Ice in Rivers and Harbors.* The following are exceptional cases of ice formation in the southern portions of the country. *Arkansas:* Little Rock, 3d, 24th, 26th. *Louisiana:* New Orleans, 25th, thin ice formed on quiet water. Reports from the sugar districts say that the eyes of the cane have been killed by the hard freeze. *Maryland:* Fallston, 25th, ½ inch thick. *Mississippi:* Fayette, 24th, ⅛ inch; 25th, ½ inch. Vicksburg, 24th, first of season. *Alabama:* Montgomery, 24th, first of season; 25th. Mobile, 25th, thick ice in exposed places; 26th. *South Carolina:* Sumter, 25th, first cold day of the season, ice ½ inch thick in the streets. Darlington, 25th, "plenty of ice." Charleston, 25th, large quantities of ice formed in all parts of the city and remained unmelted until 10 a. m. Stateburgh, 4th; 25th, ½ inch thick. *North Carolina:* Wilmington, 25th, ice in exposed places ½ inch thick. Lenoir, 16th, 17th. Weldon, 16th, first of season. *Tennessee:* Ashwood, 16th. Austin, 20th. *Texas:* Austin, 25th. Clarksville, 20th; 24th, ¼ to ⅜ inch thick. McKavett, 24th, ¼ inch; 25th. Fort Griffin, 19th. Brackettville, 25th, ⅛ inch, first of season. Denison, 24th. Cuero and Victoria, 24th; 25th, in exposed places. *Virginia:* Johnsontown, 16th. *Indian Territory:* Fort Sill, 19th, ½ inch, first of season. Fort Gibson, 20th, 1 inch.

PRECIPITATION.

The general distribution of rainfall for the month of November, 1881, is shown on Chart No. III from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records of Signal Service stations, added to which is a comparison of the present month with such averages for several years. A comparative examination of the rainfall chart reveals the existence of a large area of excess embraced by the parallels of 30° and 48° N., and the meridians of 77° and 100° W. Within this extensive region the departures of excess range in the extremes from 0.35 inch in the South Atlantic States to 2.56 inches in the Lower Missouri Valley. Excepting the South Atlantic States there is a continuous area of deficiency along the Atlantic coast from Florida peninsula northeastward to the Canadian maritime provinces. On the Pacific coast there is an unbroken area of deficiency from Lower California northward to British Columbia, the departures ranging from 0.52 inch in the Middle Pacific Coast region to 1.54 inches in North Pacific Coast region. As a means of interesting comparison, the following maximum departures from the average are given for each year since 1872, together with the corresponding districts: 1873, large deficiency, Lower Missouri Valley; 1874, +2.88 inches, North Pacific Coast region and —2.00 inches, Western Gulf States; 1875, +5.40 inches, Middle and North Pacific Coast regions and +2.05 inches, Ohio Valley and Tennessee; 1876, —2.00 inches, Ohio Valley and Tennessee; 1877, +2.88 inches, Middle Atlantic States and +2.23 inches, Upper Lake region; 1878 +2.64 inches, Saint Lawrence valley and —2.00 inches, Middle and North Pacific Coast regions; 1879, +3.32 inches Lower Missouri Valley and +2.65 inches Upper Mississippi Valley; 1880, —5.33 inches, North Pacific Coast region and +3.38 inches, Western Gulf States.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rainfalls in the lower left-hand corner of Chart No. III. The following items of importance in connection with this subject are reported by voluntary observers: *Illinois:* Riley, monthly rainfall 0.46 inch above the average for the past twenty years; autumn of the present year, wettest ever recorded, the total precipitation being 6.96 inches more than the average of this season for the past twenty years, and 2.83 inches more than the maximum for that period which occurred in 1868. *Kansas:* Lawrence, monthly rainfall 0.49 inch above the average for the past thirteen years. Yates Centre, monthly rainfall 0.60 inch above that of 1880. Wellington, monthly rainfall 1.11 inches above the average of the past two years. *Maine:* Gardiner, monthly rainfall 1.19 inches below the average of the past forty-five years. *Maryland:* Fallston, monthly rainfall 0.75 inch below the average for the past ten years. *Massachusetts:* Worcester, monthly rainfall 0.10 inch above that for 1880. *Missouri:* Saint Louis, Missouri Weather Service reports monthly rainfall 6.32 or 3.37 inches above the average of past forty-five years; this rainfall has been exceeded but three times since 1839 viz.: in 1847, 1869, and 1876, when the November rainfalls were 8.63, 7.48, and 11.55 inches respectively. *New Hampshire:* Contoocookville, rainfall slightly below the average of past ten years. *New Jersey:* monthly rainfall 3.07 inches, or 0.70 below the average for past thirty-eight years; this monthly rainfall has been exceeded in twenty-two of the preceding thirty-eight years; autumn rainfall 4.26 inches below the average of this season for the past thirty-eight years; the largest rainfall, 17.60, occurred in the autumn of 1847; smallest rainfall, 6.01, occurred in the autumn of 1879. The quantity of rain for the autumn of 1881 has been exceeded in every year, at this season, but one (1879) during the past thirty-eight years. *New York:* North Volney, monthly rainfall, 1.23 inches below the average of the past nine years; rainfall for autumn, 2.68 inches below the average for this season for the past nine years; the autumn of 1881 has been the dryest on record. Palermo, monthly rainfall 2.50 inches below the average of the past twenty-two years; largest monthly rainfall, 8.30 inches, occurred in 1863; smallest monthly rainfall, 1.40 inches, occurred in 1867. Waterburgh, monthly rainfall 0.23 inch above the average for the past ten years. *Virginia:* Wytheville, the following report is made by Mr. Howard Shriver, voluntary observer: "Rainfall for November differed little from the average, consequently the amount of rain due for the year, thus far, remains, as at the end of October, deficient."

Special heavy rains.—1st, Emmittsburg, Md., 2.94 inches; Pike's Peak, 2.91. 6th, New Orleans, 2.99; Mobile, 4.50 in ten hours; Pensacola, 3.54; Fort Barrancas, Fla., 6.07 in twelve hours. 6th and 7th, Green Springs, Ala., 3.07. 7th, Highlands, N. C., 2.50. 7th and 8th, Emmittsburg, Md., 3.80; Ellsworth, N. C., 3.00. 8th, Mount Washington, 2.81; Shreveport, 2.50. 9th, Highlands, N. C., 3.10. 11th, Niles, Mich., 2.67; Chicago, 3.18, Vicksburgh, 3.52, Point Pleasant, La., 4.02. 11th and 12th, Coldwater, Mich., 3.10. 14th, Fort Gaston, Cal., 2.38. 18th, Springfield, Ill., 2.70; Indianapolis, 4.30; Columbus, 2.81; Champaign, Ill., 2.72; Boonville, Mo., 3.10; Hermann, Mo., 2.70. 19th, College Hill, Ohio, 2.50; Thatcher's Island, Mass., 3.19. 23d, Cape Henry, Va., 2.81.

Largest monthly rainfalls.—Mount Washington, 15.10 inches; Thatcher's Island, Mass., 11.28; Emmittsburg, Md., 11.00; Highlands, N. C., 9.69; Indianapolis, 9.35; Cape Henry, Va., 8.96; Point Pleasant, La., 8.60; Ellsworth, N. C., 8.50; Chamois, Mo., 8.34; Ashwood, Tenn., 8.10; Fort Barrancas, Fla., 8.09; Fort Stevens, Oreg., 7.88; Champaign, Ill., 7.78; Coldwater, Mich., and New Corydon, Ind., 7.42; Mobile, 7.36; Fort Canby, Wash., 7.29; Pensacola, Fla., 7.27; New Orleans, La., 7.24; Auburn, N. H., 6.95; Springfield, Ill., 6.93; Portland, Oreg., 6.91; Niles, Mich., 6.81; Olympia, 6.75; Saint Louis, 6.74; Saint Charles, Mo., and Mascoutah, Ill., 6.60; Little Rock, 6.50; New Shoreham, R. I., 6.47; Northport, Mich., 6.30; Evansville, Ind., 6.25; O'Fallon, Mo., Anna, Ill., Fayette, Miss., and Lenoir, N. C., 6.10; Vicksburgh, 6.07; Jacksonburgh, Ohio, 6.05; and Norfolk, 6.04.

Smallest monthly rainfalls.—Browns and Tecoma, Nev., Terrace and Kelton, Utah, Maricopa, Wilcox, Yuma, and Tucson, Ariz., and Indio, Cal., none; Stockton, Tex., and Fort Washakie, Wyo., 0.07 inch; Williams and Spadra, Cal., 0.08; Pioche, Wadsworth, and Toano, Nev., and Willows, Cal., 0.10; Golconda, Nev., and Campo, Cal., 0.11; San Diego and Newhall, Cal., and Rapid City, Dak., 0.12; Smithville, Dak., 0.14; Fort Meade, Dak., 0.15; San Fernando, Cal., 0.16; Humboldt, Nev., 0.18; Fort Wingate, N. Mex., 0.19; Promontory, Utah, 0.20; Fort Verde, Ariz., 0.21; Carlin, Nev., and Princeton, Cal., 0.22; Los Angeles, Cal., 0.27; Sumner, Cal., and Terry's Landing, Mont., 0.28; Cheyenne, 0.29; Halleck, Nev., Prescott, Ariz., and Tulare, Cal., 0.30; Borden, Cal., and Fort Sully, Dak., 0.31; Winnemucca, Nev., and Camp Thomas, Ariz., 0.32; Anaheim, Cal., and Florence, Ariz., 0.34; Bismarck, Dak., 0.35; Phœnix, Ariz., 0.36; North Platte, 0.37; Colton, Cal., 0.38; Fort Buford, Dak., 0.39; Santa Barbara, Cal., 0.40; Wickenburgh, Ariz., 0.41; Delano, Cal., and Fort Elliott, Tex., 0.42; Fort Bridger, Wyo., and Fort Keogh, Mont., 0.44; Huron, Dak., 0.45; Merced and Goshen, Cal., 0.47; Mason, Tex., and Saint Vincent, Minn., 0.48; Lordsburgh, N. Mex., 0.49; Otega, Nev., Morristou and Fort Totten, Dak., El Paso and Concho, Tex., and Genesco, Ill., 0.50.

Rainy days.—The number varied in New England from 12 to 26; Middle Atlantic States, 10 to 19; South Atlantic States, 8 to 15; Florida Peninsula, 8 to 19; East Gulf States, 11 to 14; West Gulf States 6 to 16; Ohio Valley and Tennessee, 11 to 16; Lower Lake region, 14 to 24; Upper Lake region, 15 to 24; extreme Northwest, 10 to 17; Upper Mississippi Valley, 10 to 18; Missouri Valley, 6 to 12; Northern Slope, 7 to 15; Middle Slope, 5 to 15; Southern Slope, 1 to 7; Northern Plateau, 7 to 15; Middle Plateau, 3 to 11; Southern Plateau, 0 to 5; North Pacific Coast region, 12 to 18; Middle Pacific Coast region, 4 to 6; South Pacific Coast region, 0 to 3.

Cloudy days.—The number varied in New England from 8 to 15; Middle Atlantic States, 7 to 17; South Atlantic States, 5 to 13; Florida Peninsula, 5 to 8; East Gulf States, 9 to 10; Western Gulf States, 6 to 11; Rio Grande Valley, 6 to 14; Ohio Valley and Tennessee, 6 to 12; Lower Lake region, 13 to 20; Upper Lake region, 10 to 22; extreme Northwest, 6 to 12; Upper Mississippi Valley, 6 to 15; Missouri Valley, 6 to 11; Northern Slope, 4 to 11; Middle Slope, 2 to 5; Southern Slope, 2 to 8; Southern Plateau, 0 to 3; Middle Plateau, 2 to 8; Northern Plateau, 5 to 16; North Pacific Coast region, 13 to 22; Middle Pacific Coast region, 2 to 3; South Pacific Coast region, 0 to 2.

Largest monthly snowfalls.—Mount Washington, about 62.00 inches; Pike's Peak, 47.60; Cisco, Cal., 36.00; Summit, Cal., 30.50; Truckee, Nev., 27.00; Moorhead, Minn., 14.10, Salt Lake City, 14.00; Boca, Nev., 12.00; Helena, Mont., 11.90; Yankton, 8.60; Deadwood, 8.40; Fort Stevenson, Dak., 8.20; Alta, Cal., 8.00; Fort Missoula, Mont., 7.90; Corrinne, Utah, 7.00; Fort Bennett and Fort Shaw, Dak., 6.90; Fort Assinniboine, Mont., 5.30; Otega, Nev., 5.00.

Snow.—The dates on which snow fell in the various districts are as follows: New England, 4th to 8th, 10th to 13th, 15th, 16th, 19th to 28th; Middle Atlantic States, 3d, 4th, 12th, 15th, 20th, 23d, 24th, 25th, 27th; Ohio Valley and Tennessee, 3d, 4th, 6th, 10th, 14th, 16th, 19th, 20th, 21st, 23d, 24th, 26th; Lower Lake region, 3d, 4th, 5th, 11th, 12th, 14th, 15th, 18th to 22d, 24th to 28th; Upper Lake region, 1st to 5th, 8th to 27th, 29th, 30th; extreme Northwest, 1st, 2d, 4th, 5th, 7th, 8th, 10th to 18th, 20th, 21st, 22d, 24th, 25th, 26th, 28th, 30th; Upper Mississippi Valley, 2d to 5th, 10th to 15th, 17th to 21st, 23d, 25th, 30th; Missouri Valley, 2d, 3d, 8th, 10th to 14th, 16th to 18th, 20th, 23d, 25th, 26th, 29th, 30th; Northern Slope, 1st, 2d, 4th to 19th, 21st to 23d, 25th, 28th, 29th, 30th; Middle Slope, 1st, 2d, 3d, 7th to 14th, 17th to 19th, 23d, 29th, 30th; Southern Slope, Coleman City, 19th, and Fort Elliott, 11th, 17th; Southern Plateau, 1st, 6th, 8th to 11th, 17th, 19th, 20th; Middle Plateau, 1st, 2d, 6th to 13th, 15th to 18th, 28th, 29th; Northern Plateau, 7th to 9th, 11th, 13th, 14th, 16th, 17th, 20th, 22d, 23d, 25th, 26th, 28th, 30th; North Pacific Coast region, Albany, Oreg., 13th, 14th, and Roseburgh, 17th. Cases of particularly heavy snow were reported as follows: Pueblo, Colo., 11th, reports from western Kansas, eastern Colorado, and northern New Mexico show exceedingly heavy snow for past thirty-six hours; eastward to Crown Lake, from 6 to 8 inches fell, while from Lojunk westward, 18 to 25 inches were reported; all cuts full and heavy drifts forming rapidly. This was the heaviest snow-storm in New Mexico and Colorado, that the Santa Fé Railroad has ever encountered. Lincoln, Nebr., 10th, violent storm, snow falling at the rate of one inch per hour. Cheboygan, Mich., 4th, 6 inches fell during the night. Cabot, Vt., 4th, snow fell to the depth of 14 inches. Winnepeg, Manitoba, 17th, very heavy snow-storms during the past few days; all railway work suspended, trains blockaded, grading contracts closed for the season. Sherman, Wyo., 11th, blinding snow-storm and heavy drifts; overland trains abandoned. Milford, Pa., 23d, very heavy snow throughout Pike County. Jamestown, N. Y., 4th, furious storm all day; 12 inches deep in northern part of county. Portsmouth, N. H., 4th, very heavy storm throughout western portion of State. Friendship, N. Y., 4th, snow fell to a depth of 8 inches. Ellsworth, N. C., 16th, mountains covered with snow; 24th, mountains covered with snow, which is blown off in such quantities as to make it appear like a snow-storm, although the weather is clear. Dyberry, Pa., 25th, 26th, snow sufficient for sleighing.

Snow from a cloudless sky.—Dubuque, 23d, from 8.40 to 8.55 p. m. Rochester, 28th, 6.58 a. m., no clouds were visible within 45° of zenith. New Haven, 20th. Lansing, Mich., 13th, 9 p. m., rain and snow fell from a cloudless sky, lasting fifteen minutes. Bismarck, Dak., 18th.

Depth of snow on ground at end of month.—Saint Vincent, Minn., 10 inches; Pike's Peak, 6; Denver, 5; Umatilla, Oreg., and Mount Washington, 4; Helena, Mont., and

Dayton, Wash., 2½; Embarrass, Wis., 2; Escanaba, 1½; Franklin, Wis., and Moorhead, Minn., 1; Mendon, Mass., ¾; Neillsville, Wis., and Alpena, Mich., ½; Fort Benton, Mont., Springfield, Mass., and Des Moines, ¼; Salt Lake City, 1 to 5; Dyberry, Pa., 2 to 3; Marquette, Mich., La Crosse and Madison, Wis., Albany and North Volney, N. Y., and Morrison, Ill., trace.

Sleet.—Sedalia, Mo., 17th, heaviest storm of the kind ever before experienced in this section; shade trees, fences, and buildings heavily coated with ice, the first mentioned being greatly damaged; loss to city estimated at $5,000. Springfield, Ill., 17th, trees, telegraph wires, and fences covered with a heavy coating of ice; telegraphic communication seriously interrupted. Carrollton, Ill., 17th, trees covered with ice and in many cases badly broken; telegraphic communication seriously interrupted. Boonville, Mo., 17th, unusually heavy storm of sleet causing great damage to orchards and shade trees. Clinton, Ill., 17th, one of the heaviest storms of sleet ever known in this section; great damage to orchards. Independence, Mo. 18th, very heavy and disastrous, followed by snow. Griggsville, Ill., 18th, worst storm of sleet in the past twenty-five years; the damage to fruit and shade trees was considerable; many trees, six inches in diameter, were snapped off by the weight of the ice. Highlands, N. C., 24th, during morning a frozen mist like sleet covered the forest. Port Huron, 23d, 11.15 a. m., during storm great sheets of sleet swept over the city; continued until 2.10 p. m., when it turned to rain. Northport, Mich., 25th, 3 a. m., accompanied by an exceedingly violent gale causing a great many wrecks on the north shore of Lake Michigan.

Hail.—Near Dry Pond, Jackson County, Ga., 8th, causing great damage to crops, destroying cotton and beating the bark off trees and stumps; five days after the storm hailstones were found in some places 16 inches deep, many stones being as large as partridge eggs. Fall River, Mass., 15th, greatest fall of hail that has been experienced here for years.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 71 to 86; Middle Atlantic States, 66 to 78; South Atlantic States, 71 to 81; Florida Peninsula, 74 to 79; East Gulf States, 72 to 78; West Gulf States, 69 to 81; Rio Grand Valley, 67 to 83; Ohio Valley and Tennessee, 67 to 77; Lower Lake region, 65 to 76; Upper Lake region, 75 to 83; Extreme Northwest, 69 to 87; Northern Slope, 58 to 73; Middle Slope, 49 to 76; Southern Slope, 52 to 70; Southern Plateau, 42 to 61; Middle Plateau, 40 to 65; Northern Plateau, 69 to 85; North Pacific Coast region, 82 to 86; Middle Pacific Coast region, 56 to 64; South Pacific Coast region, 39 to 61. High stations report the following percentages not corrected for altitude: Pike's Peak, 76.2; Denver, 60.2; Cheyenne, 58.2; Mount Washington, 86.0.

WINDS

The prevailing winds during the month of November, 1881, at Signal Service stations are shown on Chart No. II, by arrows, which fly with the wind. In the South Atlantic and East Gulf States, northeasterly; in the Middle Atlantic States and New England, northwesterly; in the Lake region, Tennessee and Ohio Valley, southerly; in the Upper Mississippi and Missouri Valleys, northwesterly; in the Western Gulf States, including Texas, southerly and northerly; in the Rocky Mountain and Plateau regions, variable; in the North Pacific Coast region, southerly; in the Middle and South Pacific coast regions, north to west.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 31,375 miles; Pike's Peak, 17,519; Delaware Breakwater, 12,861; Cape May, 12,675; New Shoreham, R. I., 12,501; Wood's Holl, Mass., 12,370; Thatcher's Island, Mass., 11,337; Sandusky, 11,250; Sandy Hook, 11,143; Grand Haven, 11,044; Indianola, 10,886; Erie, 10,538; Kittyhawk, 10,529; Rochester, 10,338; Port Eads, La., 10,320; Milwaukee, 10,128; Buffalo, 10,114; Madison, Wis., 9,884; Champaign, Ill., 9,808; Cape Henry, Va., 9,712; Hatteras, N. C., 9,611; Portsmouth, N. C., 9,398; Barnegat, N. J., 9,379; Cleveland, 9,283; Alpena, Mich., 9,179; Galveston, 9,178; Port Huron, 9,011; North Platte, 8,927; Key West, 8,828; Moorhead, Minn., 8,810; Saint Vincent, Minn., 8,722; Saint Louis, 8,618; Omaha, 8,581; Huron, Dak., 8,499; Dodge City, 8,402; Fort Stevenson, Dak., 8,378; Cheyenne, 8,350; Burlington, Vt., 8,346; Marquette, 8,329; Fort Sill, Ind. T., 8,323; Detroit, 8,315; Oswego, 8,121; Newport, R. I., 8,099; Toledo, 8,090. The smallest are Missoula, Mont., 935; La Mesilla, N. Mex., 1,082; Lynchburgh, 1,378; Phœnix, Ariz., 1,511; Silver City, N. Mex., 1,526; Visalia, Cal., 1,887; Salt Lake City, 2,205; Uvalde, Tex., 2,325; Augusta, Ga., 2,382; Lewiston, Idaho, 2,390; Spokane Falls, Wash., 2,624; Laredo, Tex., 2,615; Red Bluff, 2,858; Boise City, 2,864; Florence, Ariz., 2,934.

High winds.—On summit of Mount Washington the following high velocities were reported: 108 miles, NW., 10th; 100 miles, NW., 20th; 98 miles, NW., 9th, 18th; velocities exceeding 50 miles per hour were reported from 2d to 22d and from 24th to 30th. On summit of Pike's Peak, a maximum velocity of 68 miles was reported as follows: From NE., 11th; SW., 12th, 16th; velocities exceeding 50 miles per hour were reported from 4th to 6th, 11th, 12th, 14th to 16th, 18th, 19th, 24th. Other stations reporting velocities of 50 miles per hour or over are as follows: Fort Custer, Mont., 53 miles, NW., 12th; North Platte, 50, NW., 4th; Fort Buford, 50, W., 13th; Bismarck, 50, W., 13th; Indianola, 55, N., 2d; Sandusky, 56, W., 14th; Thatcher's Island, Mass., 56, NW., 11th; Wood's Holl, Mass., 50, NW., 20th; Cape May, maximum velocity, 66, NW., 20th, 52, NW.; 4th, 15th, and 55, NW., 24th; Delaware Breakwater, 54, NW., 24th; Cape Henry, Va., 52, NW., 3d, 4th; Kittyhawk, 52, N., 4th.

Local storms.—Near Fort Ridgely, Minn., 25th, very violent tornado moved from southwest to northeast, causing great destruction of property. A large black, funnel-shaped cloud approached rapidly from the west, and when near by the center of the cloud appeared to change its color to a dirty green and purple; lightning flashed and heavy thunder rolled. While the dark cloud was passing the wind whirled with indescribable rapidity; one man was thrown against a tree and his side smashed; another was carried high in the air and thrown lifeless on the ground, his clothing being entirely stripped from his body. Wild ducks, prairie chickens, and domestic fowls were killed in considerable numbers and entirely stripped of feathers; in some instances harness was completely torn from the backs of horses and the animals killed or badly wounded. All houses in the track of the storm were entirely demolished. Fayette, Miss., 11th, at a point four miles east of station, a violent tornado suddenly made its appearance in a gentleman's yard. Every tree was blown down and many were scattered in all directions. In the house, crockery, etc., was broken, but the building, a strong frame, was not injured, the doors and windows being open. An eye witness states that the air was filled with flying timber. The tornado passed off very quickly, and lifted from the ground, doing no other damage for a considerable distance until it again descended to the earth, when it entirely demolished a dwelling and a cotton-house, scattering and carrying their contents great distances. Various articles of clothing were seen whirling through the air. Its track was narrow and about eight miles in length.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for November, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 86.02 per cent. The percentages for the four elements are: Weather, 88.25; Direction of the Wind, 81.96; Temperature, 87.71; Barometer, 86.03 per cent. By geographical districts they are: For New England, 87.3; Middle Atlantic States, 88.4; South Atlantic States, 89.8; Eastern Gulf States, 85.4; Western Gulf States, 86.2; Lower Lake region, 85.3; Upper Lake region, 84.6; Tennessee and the Ohio Valley, 86.8; Upper Mississippi Valley, 86.4; Lower Missouri Valley, 80.6; Northern Pacific Coast region, 65.9; Central Pacific Coast region, 86.6; Southern Pacific Coast region, 93.5. There were 78 omissions to predict out of 3,690, or 2 per cent. Of the 3,612 predictions that have been made, 130, or 3.60 per cent. are considered to have entirely failed; 117, or 3.24 per cent. were one-fourth verified; 367, or 10.16 per cent. were one-half verified; 414, or 11.46 per cent. were three-fourths verified; 2,584, or 71.54 per cent. were fully verified, so far as can be ascertained, from the tri-daily reports.

Cautionary signals.—221 cautionary signals were displayed during the month of November, 1881, of which 199, or 90.09 per cent., were fully justified by winds of 25 miles per hour, or over, at, or within, a radius of 100 miles of the station. Sixty-seven off-shore signals were displayed, of which 51, or 76.12 per cent., were fully justified; 53, or 79.10 per cent., were justified as to direction; 61, or 91.05 per cent., were justified as to velocity, and 4, or 5.97 per cent., completely failed. Twenty-one off-shore signals were changed from cautionary. Two Northwest signals were displayed, both of which were fully justified. Two hundred and ninety signals, of all kinds, were displayed, of which 252, or 86.89 per cent., were fully justified. The above does not include signals ordered at 67 display stations, where the velocity is only estimated. One hundred and forty-nine winds, of 25 miles, or over, were reported, for which no signals were ordered. Forty-nine signals were ordered late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of November, 1881. The water in the Missouri River has remained at a very low stage throughout the month, being at all stations, even on the date of highest water, from 10 to 18 feet below the danger-line. In the Mississippi River there has been a moderately high stage from St. Paul to Dubuque; at Davenport and Keokuk the water has been from 1 to 5 feet above the danger-line; at St. Louis within six inches of the danger-line, and from Cairo to New Orleans all stations remained from 4 to 8 feet below the danger-line. In the Ohio, Cumberland, Tennessee, and Monongahela Rivers the water remained quite low throughout the month, the highest being at Pittsburgh, where it reached within eight feet of the danger-line. In the Red, Arkansas, Savannah, and Sacramento Rivers no changes of importance took place; water quite low throughout the month.

Ice in rivers and harbors.—Saginaw River: East Saginaw, 25th, ice forming rapidly and people reported crossing on the ice at Zilwaukee. Bay City, 24th, ice formed during the night, and on the following day river full of broken cakes of ice. *Dakota River:* Morriston, Dak., 14th, river frozen over. *Embarrass River:* Embarrass, Wis., 28th, river frozen over. *Manitowoc River:* Manitowoc, Wis., 20th, river frozen over. *Lake Huron:* Port Huron, 25th, schooner A. J. Rogers, just in port from Thunder Bay, is badly iced up. Schooner Emerald, from Presque Isle, 25th, vessel covered with a perfect coat of ice, everything on decks frozen solid. *Mississippi River:* Red Wing, Minn., 18th, large quantities of floating ice between St. Paul and Lake Pepin; steamer Imperial was from 4 p. m. of the 18th until noon of the 22d in making a distance of 60 miles. La Crosse, 15th, floating ice in river, first of season; 28th, ice broke up in river. Davenport, 10th, although no ice has yet appeared in the river, the weather has been so cold that navigation is now considered closed for the season. Saint Paul, 15th, 17th, 24th, floating ice in river, 18th, river frozen along the banks. Steamer Arkansas left port; the last boat of season. 20th, river frozen along the banks; channel full of ice; navigation practically closed for the season. River has been open from April 7 to November 20, a period of 227 days. The greatest depth of water (19 feet 8 inches) occurred April 29; lowest (3 feet 4 inches) occurred September 14 and 15, giving a range for the season of 11 feet 5 inches; average depth, 11 feet 5 inches. 22d, ice gorged in river below city. 23d, gorge broke during morning. *Milwaukee River:* Milwaukee, 20th, river frozen over. *Red River of the North:* Moorehead, Minn., 15th, river frozen over. Saint Vincent, Minn., 13th, river frozen. Winnipeg, 18th, river frozen over, but not strong enough to permit crossing. *Tongue River:* Fort Keogh, Mont., 18th, river frozen over. *Missouri River:* Bismarck, 18th, river frozen over and teams crossing. Yankton, 18th, river frozen over. Fort Buford, 17th, river frozen over. Fort Sully, Dak., 15th, ice floating in river. Fort Hale, Dak., 17th, river closed. Morriston, Dak., 14th, river closed. *Saint Croix River:* Saint Croix, 18th, river frozen over, navigation closed. *Assinniboine River:* Winnipeg, 17th, river frozen over sufficiently strong to bear up crossing teams. *Chippewa River:* Chippewa City, 17th, both steamboat and raft navigation suspended; river full of floating ice. *Stillwater Lake:* Stillwater, Minn., 17th, lake froze over during the night. *Saint John's River:* Saint John, New Brunswick, 23d, ice forming rapidly, navigation closed. *Maumee River:* Toledo, 25th, river frozen over. *Walkill River:* Montgomery, N. Y., 25th, river nearly frozen over. *Rock River:* Rockford, Ill., 24th, river frozen over; 29th, river clear of ice. *Erie Canal:* Rochester, 26th, light floating ice. Syracuse, 26th, ice thawing quite rapidly.

Floods.—Illinois: Springfield, 22d, Sangamon River overflowed; all bottom lands flooded; loss to the corn crop in this vicinity estimated at $250,000. Riverton, 22d, terrible devastation by the flood; many fields of corn covered with water; water over wagon roads four feet deep in many places; cattle pens partially submerged. Alcohol Walk, 22d, 200 cattle and 1,300 hogs driven out of the cattle pens owing to high water; considerable loss to animal life; paper mill suspended operations and threatened with overflow; one farmer lost 2,000 bushels of corn and many others smaller quantities. Rushing River, 18th, exceedingly heavy rains; streams flooded and much damage caused to farm property. Carrollton, 17th, Apple and Macoupin Creeks higher than ever before known; many bridges carried away and much other damage done. Decatur, 18th, a violent rain storm has prevailed for the past 36 hours without cessation: farmers report the whole country under water; several bridges and over 80,000 feet of lumber carried away. Marshall, 18th, heavy rains for past two days, causing considerable damage to railroad beds and trestles; on the Cairo division of the Wabash Railroad all traffic delayed. Hillsborough, 18th, terrific storm of rain, accompanied by the heaviest flood known for many years; bridges washed away and a great amount of farm property destroyed; all trains delayed by serious washouts. Clinton, 18th, very heavy floods; much damage to bridges and farm property. Saint Francisville, 18th, railroad bridge washed away and all travel interrupted. Alton, 18th, Wood River overflowed; hundreds of acres on either side under water; all railroad bridges across the river have been swept away or made so dangerous that travel is completely checked. Charleston, 18th, creeks higher than they have been since 1875. 21st, Embarrass River higher than it has been at any time since 1875. *In-*

diana: Indianapolis, 18th, reports from the middle and southern portions of the State show great damage by heavy floods, consequent upon the recent incessant rains. White River has risen 12 feet, and, at this date, is rising at the rate of one foot per hour; water within four feet of the great rise of 1874. Two creeks passing through the city overflowed, causing great damage to private property; on some streets the water was deep enough to swim a horse. All railroads seriously affected by the floods. Vincennes, 18th, heavy and incessant rains for the past three days; Wabash River overflowed. Lafayette, 18th, Wabash River and tributaries rising rapidly; bottom lands completely submerged. Dayton, 18th, Wild Cat Creek overflowed, carrying away railroad bridge, and causing other serious damage. Muncie, 18th, heavy rains for past three days, bridges carried away. Eaton, 18th, creeks overflowed, and railroad-bridge washed away; all travel suspended. *Missouri:* Saint Louis, East Side, 19th, lowlands submerged, in some localities hundreds of acres completely under water, varying from 6 to 18 inches in depth; Cahokia Creek overflowed, and between the Stock Yards and Venice bottom lands flooded; several serious washouts on the Indianapolis and Saint Louis Railroad. The rainfall accompanying this storm of the 17th and 18th was the heaviest in this portion of Missouri for the month of November during the past ten or fifteen years. The destruction to railroad and farm property has been enormous. The rapid rise in the waters of the Missouri for this month of the year has never before been experienced in the history of Missouri floods. Railroad and telegraphic communication generally suspended. Washington, 18th, heavy rains and serious washouts on railroads; much damage to farm property. Gasconade, 18th, all trains delayed and much damage caused by the floods. Hermann, 18th, heavy washouts on the Missouri Pacific Railroad; all travel suspended. New Haven, 18th, two miles east of station railroad-bridge carried away; road-bed for several miles badly washed. *Ohio:* Coshocton, 18th, extraordinary rains during the past forty-eight hours, causing an immense amount of damage in this section of the country. All streams in this vicinity have overflowed their banks. The Tuscarawas, Walhounding, and Muskingum Rivers have risen over ten feet in the past ten hours and still rising at the same rate. Hay, corn, wheat, straw, and fences along the creek and river bottoms have been carried away by the heavy flood. *Texas:* Brackettville, 12th, most disastrous floods along the Rio Grande River that have occurred in the past thirty years; rain has fallen almost daily since the 13th of September. Brownsville, 11th, Rio Grande River higher than at any time since 1848. Matamoras, 11th, about three-fourths of the town under water; great damage to property and much suffering among the poorer classes. *Wisconsin:* Beloit, 4th, Rock River much swollen; 30 feet of dam gave way, causing suspension of work in mills.

Waterspouts.—Life Saving Station, No. 6, N. C., 5th, 9.30 a. m., a well-defined waterspout was observed off Fresh Pond Hill, three miles south of station. Its trunk proceeded from the base of a dense cumulo-stratus cloud to the water's surface. It moved gradually with a swaying, whirling motion towards a point slightly north of east and was accompanied by a sound similar to that produced by the wind in passing through a pine forest. Its mean height was about fifteen feet; color similar to that of the surrounding clouds, a dark leaden hue. No peculiar conditions of the surrounding atmosphere were apparent during its existence. Phenomenon lasted forty-five minutes.

High tides.—Punta Rassa, Fla., 23d, very high; water over one foot deep under office building.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of Chart No. III. Owing to breakage of instrument, observations at Marquette were discontinued from the 14th to the 26th, inclusive. The report from Chincoteague failed to appear in time for publication.

ATMOSPHERIC ELECTRICITY.

Auroras.—The most important display that occurred during the month was that of the 23d, which was reported by numerous intervening stations from Oswego westward to Helena, Mont., and southward to Fort Madison, Iowa. At many of the stations reporting the display was brilliant, beginning early in the evening and lasting until after midnight. The display of the 9th was observed at the following stations: Fort Bennett, 4 a. m.; Huron, Dak., 5 a. m.; La Crosse, early morning; Clinton, Iowa, 1.30 a. m.; Dubuque, 12.30 to 2.30 a. m.; Riley, Ill., 4.10 a. m.; Springfield, Ill., 5.30 a. m.; Milwaukee, early morning. The following stations report the display of the 17th: Clear Creek, Nebr.; Saint Vincent, Minn., and New Corydon, Ind. The display of the 26th was reported from Fort Shaw, Mont., Deadwood, Dak., and Northfield, Minn. Other displays have been reported from the following stations: Fort Shaw, Mont., 22d, from

8 to 11 p. m.; Deadwood, Dak., 27th, 9 p. m.; Saint Vincent, Minn., 20th, 7 p. m.; Moorehead, Minn., 10th, 5 to 5.30 a. m.; Embarrass, Wis., 19th, p. m.; New Corydon, Ind., 20th, 2 a. m.; Vevay, Ind., 12th, 8 a. m., 13th, p. m.; Port Huron, Mich., 22d, 8.40 to 9.15 p. m.; Oswego, 2d, 7.45 to 8.15 p. m., 16th, 11.30 p. m., to midnight; Newport, R. I., 16th, 11 p. m., to a. m. of 17th; Auburn, N. H., 10th; Dexter, Me., 14th; Gardiner, Me., 27th, 11.30 p. m., to 3.30 a. m. of 28th.

Thunder-storms.—They were reported in the various districts as follows: New England, 9th, 15th; Middle Atlantic States, 8th, 9th; South Atlantic States, 9th, 30th; East Gulf States, 2d, 6th, 8th, 11th, 12th, 26th, 30th; West Gulf States, 1st, 7th, 8th to 11th, 18th, 21st, 30th; Ohio Valley and Tennessee, 8th, 9th, 16th, 17th, 18th, 30th; Lower Lake region, 5th, 14th; Upper Lake region, 16th, 30th; Extreme Northwest, Fort Stevenson, 13th, 17th; Upper Mississippi Valley, 7th, 8th, 10th, 11th, 18th, 30th; Missouri Valley, 7th, 10th, 11th, 17th, 18th; Southern Slope, 1st, 2d, 10th, 11th; Middle Slope, 10th, 11th, 17th; Southern Plateau, Camp Thomas, Ariz., 9th; North Pacific Coast region, Roseburgh, 17th; Middle Pacific Coast region, Red Bluff, 15th.

Zodiacal light.—Nashville, Tenn., 2d, 13th, 14th, 19th, 20th, 25th, 26th, 27th, 28th, 29th; Chattanooga, 14th; Cresco, Iowa, 19th; Cambridge, Mass., 11th, 14th, 15th, 20th, 25th, 26th; Somerset, Mass., 22d, 24th, 25th; Clear Creek, Nebr., 18th to 24th; Wytheville, Va., 13th; New Corydon, Ind., 2d, 4th, 21st, 22d, 23d, 25th, 27th to 30th.

OPTICAL PHENOMENA.

Lunar halos have been observed in the various districts on the following dates: New England, 3d to 7th, 9th, 10th, 11th, 29th, 30th; Middle Atlantic States, 2d, 5th, 6th, 7th, 20th, 27th, 28th, 29th; South Atlantic States, 1st to 3d, 5th, 23d, 28th, 30th; East Gulf States, 1st to 5th, 9th, 28th; West Gulf States, 1st to 4th, 6th, 12th, 13th, 14th, 28th, 30th; Rio Grande Valley, 2d, 3d, 13th; Ohio Valley and Tennessee, 1st to 6th, 9th, 11th, 16th, 25th, 29th, 30th; Lower Lake region, 1st, 2d, 6th, 7th, 25th, 28th, 29th, 30th; Upper Lake region, 1st, 4th to 6th, 10th, 28th, 29th; Extreme Northwest, 5th, 6th, 8th, 27th; Upper Mississippi Valley, 1st, 4th, 5th, 6th, 9th, 10th, 18th, 27th, 28th, 29th; Missouri Valley, 2d, 5th, 6th, 28th, 29th; Northern Slope, 1st, 5th, 9th, 10th, 13th, 26th, 29th, 30th; Middle Slope, 1st, 6th, 8th, 28th; Southern Slope, 3d, 4th, 28th; Southern Plateau, 2d, 3d, 5th, 6th, 27th; Middle Plateau, 2d, 5th, 17th, 27th, 30th; Northern Plateau, 8th, 14th, 26th, 29th, 30th; North Pacific Coast region, 1st, 2d, 13th, 26th; Middle Pacific Coast region, 5th, 26th, 29th; South Pacific Coast region, 4th, 5th, 26th, 28th, 30th.

Solar halos have been observed in the various districts on the following dates: New England, 5th, 7th, 10th, 11th, 21st, 22d, 23d; Middle Atlantic States, 10th, 22d, 28th, 29th; East Gulf States, 10th, 14th, 29th; West Gulf States, Little Rock, 6th; Ohio Valley and Tennessee, 6th, 8th to 11th, 17th, 22d to 25th, 29th; Lower Lake region, 6th, 9th, 10th, 11th, 23d, 25th; Upper Lake region, 13th, 20th, 21st, 26th; extreme Northwest, 15th to 18th, 23d; Upper Mississippi Valley, 5th, 10th, 19th, 23d, 29th; Missouri Valley, Huron, Dak., 23d; Northern Slope, North Platte, 1st, 24th; Middle Slope, 6th, 24th, 26th, 29th; Southern Slope, Fort Griffin, 19th; Northern Plateau, Umatilla, 2d, 12th; North Pacific Coast region, Albany, Oreg., 13; Middle Pacific Coast region, 5th, 12th, 26th, 27th.

Mirage.—Northport, Mich., 13th; Indianola, 2d to 4th, 6th, 12th to 14th, 20th, 22d to 25th.

MISCELLANEOUS PHENOMENA.

Meteors.—Yuma, Ariz., 2d., 8 p. m., started from the constellation Andromeda at an altitude of 50°; pursued a southeasterly course, and disappeared near the Pleiades. It started slowly and gradually increased in speed, leaving behind a long train of whitish red color. Louisville, 16th, 7 p. m., very large; made its appearance in eastern sky, about 45° above horizon, and shot over toward the west. When about in the zenith, the head of the meteor seemed to expand, becoming much greater in size and brilliancy. It disappeared in the west, leaving a track behind that remained faintly luminous for fifteen minutes. Wytheville, Va., 2d, 9 p. m., a large meteor was observed at an altitude of 15° or 20° above the horizon in the southeastern sky. Its size was, apparently, equal to that of the full moon. It left a train of hazy white, which disappeared shortly after its flight. Eastport, 20th, very bright, first observed in northern sky; pursued an easterly course; duration of flight, about five seconds. Vevay, Ind., 16th, 7 p. m., very brilliant; illuminated the city and adjacent country. Its course was from zenith to a southwesterly point, where it burst like a rocket. Meteors worthy of less note have been reported as follows: Umatilla, Oreg., 15th; Boise City, Idaho, 8th, 9th, 22d; Pioche, Nev., 27th, 28th; Yuma, Ariz., 25th; Davenport, 28th; La Crosse, 24th; Springfield, Ill., 14th; Detroit, 29th, numerous; Rio Vista, Cal., 4th, very brilliant; Southington, Conn., 13th, 14th, 15th; New Corydon, Ind., 2d; Vevay, 5th, 12th to 16th, 19th, 22d, 30th; Monticello, Iowa, 12th, 13th, 14th, 17th; Clinton, Iowa, 15th; Woodstock, Md., 13th, 15th; Springfield, Mass., 15th; Fall River, Mass., 20th; Fayette, Miss., 13th, 27th; Corning, Mo., 8th; Atco, N. J., 16th, 22d; Freehold, N. J., 6th, 14th, 22d; Moorestown, N. J., 13th; Vineland, N. J., 15th; Jacksonburgh, Ohio, 16th; Fallsington, Pa., 14th; Stateburgh, S. C., 9th, 13th, 14th; Clarksville, Tex., 15th, 16th, 20th.

Earthquakes.—San Francisco, 11th, 4 p. m., slight shock; 13th, 11.20 p. m., slight shock of about twenty seconds duration. Carson City, Nev., 9th, 10 a. m., sharp shock of two seconds duration; motion from north to south. Berne, Switzerland, 18th, two heavy shocks during the night. Cologne, Prussia, 18th, violent shock of short duration occurred during the night, and slight tremors were felt for several hours after it. On the same night two shocks were felt at Bonn, Germany. These earthquakes originated at Zurich and passed in two waves through western Germany towards Holland. Agram, Austria, 15th, three shocks of earthquake were experienced during the night. Messina, Italy, 16th, two shocks, the first at 1 a. m. and the second at 5.40 a. m.; considerable loss of life and property in the interior. These shocks were felt at Naples, Catanazaro, and Cozenza. Pesth, Hungary, 15th, three shocks were experienced during the night. Island of Chios, off the west coast of Asia Minor, near Cape Bianco, 11th, during past week very heavy shocks occurred and the village began sinking into the earth; town abandoned. Chilcoot, Alaska, October 2, 1.30 p. m., light shock; October 6, 11 a. m., light shock.

Migration of birds.—*Geese flying south:* Fort Adams, R. I., 11th; Somerset, Mass., 13th; Fayette, Miss., 10th; Clear Creek, Nebr., 5th, 8th, 14th; Palermo, N. Y., 13th; Bellefontaine, Ohio, 6th; Portsmouth, Ohio, 4th; Visalia, Cal., 4th, 6th, 18th, 23d; Red Bluff, Cal., 8th, 13th; Indianola, 11th, 13th, 23d; Macon, N. C., 20th. *Flying north:* Red Bluff, 25th; Indianola, 3d. *Ducks flying south:* Clear Creek; Nebr., 14th, 16th; Dubuque, 13th; Indianola, 13th, 19th, 20th. *Blackbirds:* Memphis, 9th, 10th; flying south. *Rice birds:* Memphis, 9th, 10th; flying south.

Polar bands.—Fort Sill, Ind. T., 19th; Mobile, 14th; Augusta, Ga., 3d; Gardiner, Me., 27th; Fayette, Miss., 18th, 30th; Clear Creek, Nebr., 6th, 9th, 10th, 12th, 13th, 16th, 20th, 21st, 22d, 25th, 28th; Auburn, N. H., 17th; Wytheville, Va., 3d, 5th, 6th, 17th, 26th, 29th; New Corydon, Ind., 21st.

Prairie fires.—Saint Vincent, Minn., 12th; Huron, Dak., 2d, 3d, 5th, 6th; Clear Creek, Nebr., 6th, 17th; Genoa, Nebr., 4th; Yankton, 1st, 4th to 6th, 8th, 16th, 22d, 23d, 25th, 28th; Fort Gibson, Ind. T., 16th.

Sand storms.—Winnemucca, Nev., 14th; San Carlos, Ariz., 19th, heaviest ever seen at this place; continued from 10 a. m. until midnight. Camp Thomas, Ariz., 1st, 7th, 17th, 19th, 24th.

Sunsets.—The characteristics of the sky at sunset, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 178 stations show 5,296 observations to have been made, of which 27 were reported doubtful; of the remainder, 5,269, or 84.3 per cent., were followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

Date—Nov., 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.
5, 10 a. m.	1	2	....	....	....	....	1	2
6, 12 m	2	2	0	0	1	1	3	3
10, 9 a. m	3	18†	....	....	....	....	5	20†
11, 10 a. m	0	0	0	0	0	0	5	20†
15, 2 p. m	2	8	....	....	....	....	3	20†
16, 3 p. m	0	15†	0	0	0	0	3	35†
17, 10 a. m	0	0	0	0	0	0	3	35†
20, 1 p. m	0	0	0	0	0	0	3	35†
22, 10 a. m	1	5	0	5	0	0	4	35†
24, 10 a. m	0	0	1	5	0	0	3	30†
25, 12 m	0	0	0	8	0	0	3	22†
28, 1 p. m	2	12	....	....	....	....	3	15†

†Approximated. Faculæ were seen at the time of every observation.

Mr. Wm. Dawson, at Spiceland, Ind., reports as follows: 1st, 1 group, 1 small spot on west side; 6th, 5 groups, 10 spots; 9th, 4 groups, 12 spots; 12th, 4 groups, 14 spots; 13th, 7 groups, 33 spots, 1 large spot near east edge; 28th, 4 groups, 25 spots. Mr. David Trowbridge, at Waterburgh, N. Y., reports: 6th, 1 group, 1 spot; 11th, 5 groups, 5 spots; 1 group appeared by rotation; 12th, 6 groups, 6 spots; 1 new group has arisen; 17th, 3 groups, 11 spots; 1 group of large spots; 22d, 2 groups, 11 spots; 28th, 1 group, 1 spot; the large group has disappeared by rotation. Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: sun spots were observed on every clear day during the month. They were most numerous on the 13th, 16th, 23d, and least numerous on the 1st, 27th.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

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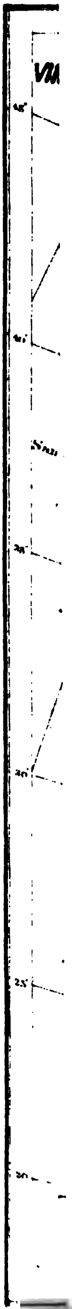
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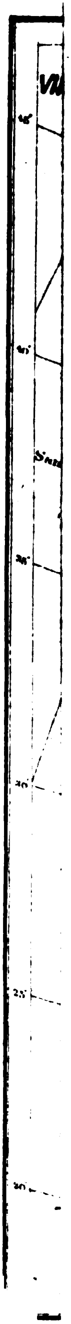
22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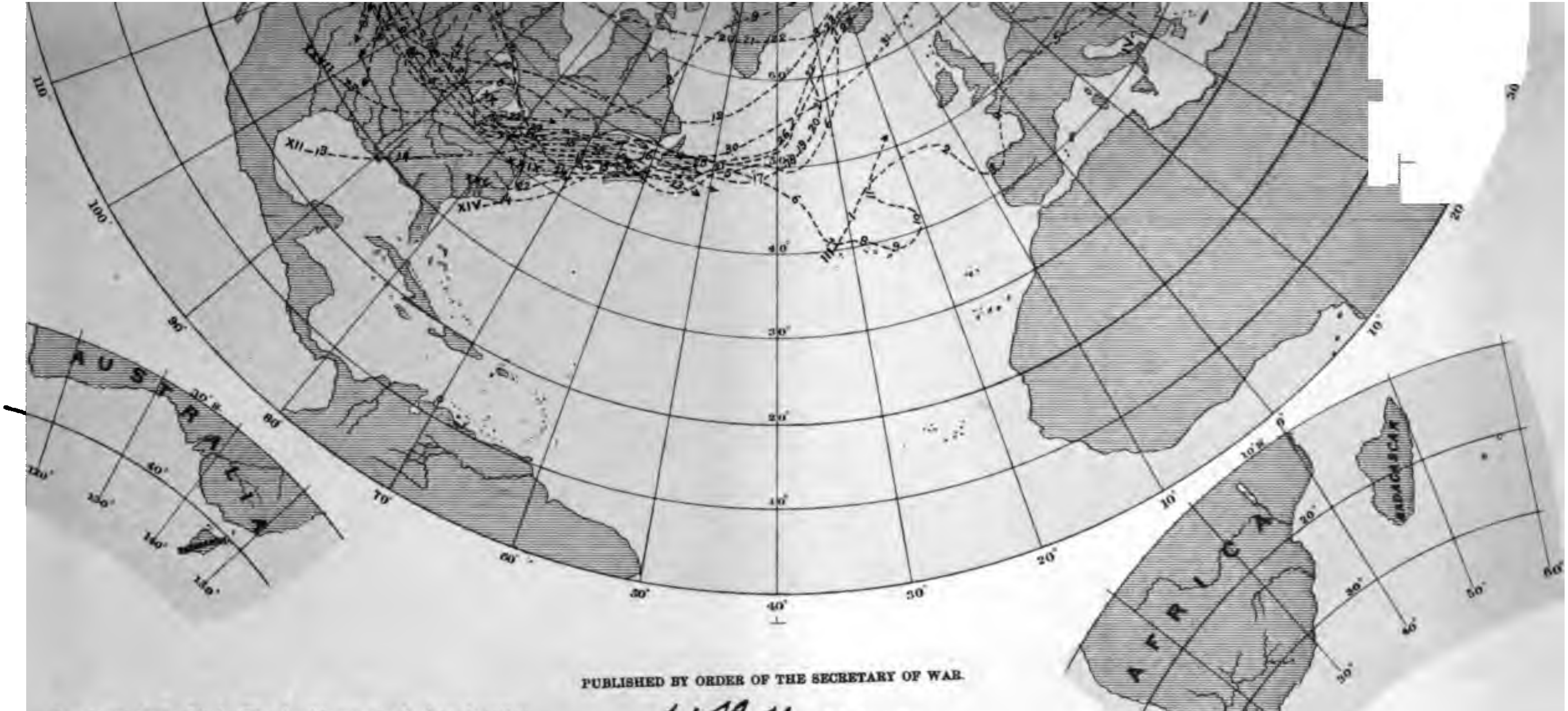


Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Broken or dotted lines, are doubtful.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL CHART.

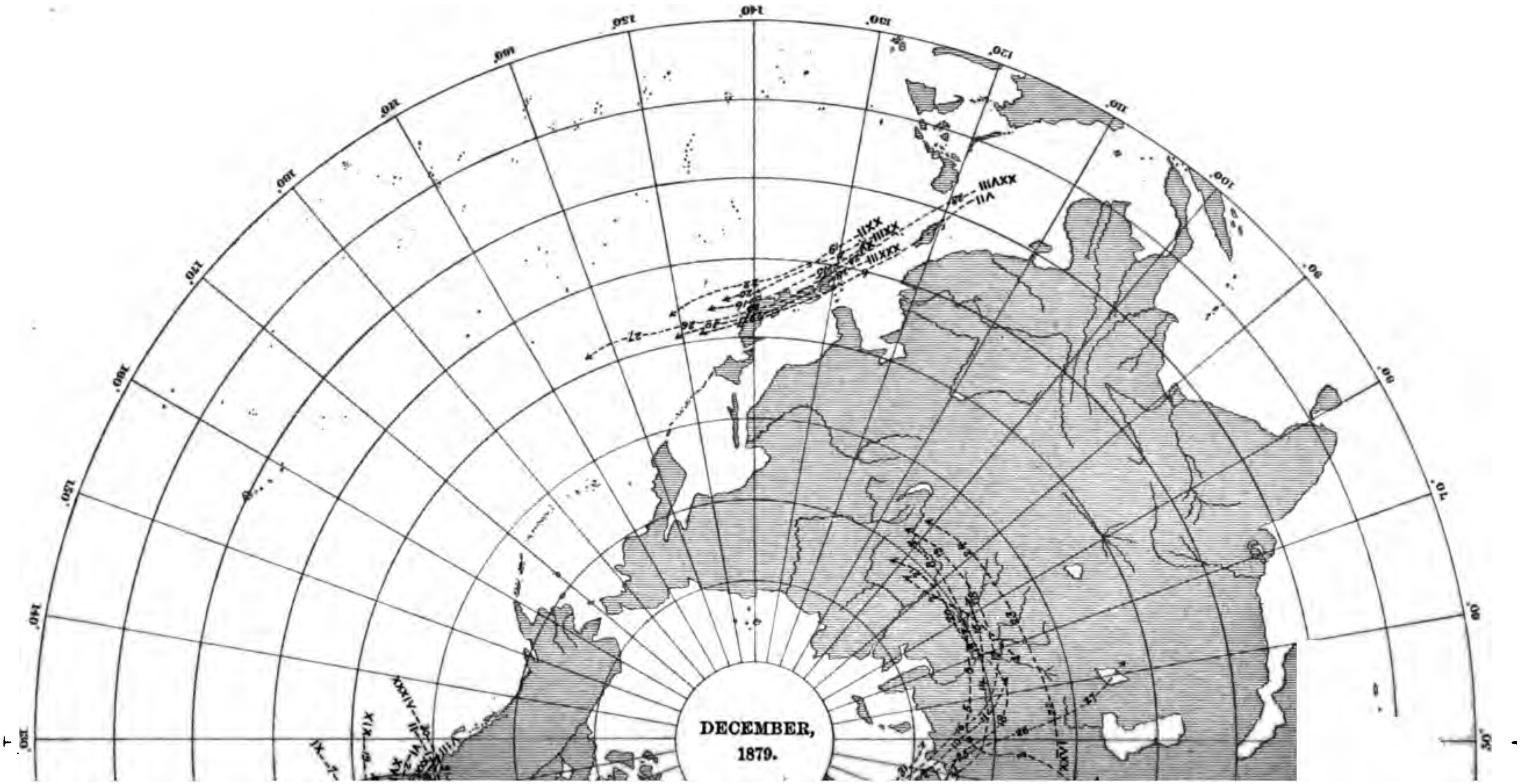
Showing Tracks of Centres of Low Barometer for December, 1879.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.



APPENDIX No. 81.

MONTHLY WEATHER REVIEW, DECEMBER, 1881.

INTRODUCTION.

In preparing this review the following data, received up to January 20, 1882, have been used, viz, the regular tri-daily weather charts, containing the data of simultaneous observations taken at 133 Signal Service stations and 14 Canadian stations, as telegraphed to this office; 193 monthly journals and 160 monthly means from the former and 14 monthly means from the latter; 215 monthly registers from voluntary observers; 58 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald Weather Service; monthly reports from the local weather service of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

To illustrate the subject of the distribution of mean atmospheric pressure over the United States and Canada for the month of December, 1881, Chart No. II has been prepared, upon which are traced the lines of equal barometric mean values. The areas of lowest mean pressure cover the northern portion of the Canadian maritime provinces and northern Minnesota, lowest barometers at Father Point and Saint Vincent, 29.99 and 30.03 respectively. The areas of highest mean pressure cover Virginia and the South Atlantic States, the Middle and Northern Slopes and the Middle and Northern Plateau regions, highest barometers, 30.24, at Augusta, Charlotte, and Knoxville, and 30.36 at Salt Lake City. Higher readings, but of doubtful certainty owing to elevation, are reported from the Plateau regions as follows: Eagle Rock, 30.50; Helena and Missoula, 30.55. The regions of lowest mean pressure and of largest deficiencies coincide with the path of greatest storm disturbance as indicated by a comparison of Charts Nos. I and II. Compated with the previous month, there has been a considerable fall in pressure throughout the Atlantic Coast States, and a compensating rise to the westward, except in the Northern Pacific Coast region, where the largest comparative fall occurs.

Departures from the normal values for the month.—Compared with the means of previous years, the mean pressure for the present month is generally above the normal throughout the country east of 87th and west of the 100th meridians. In these separate areas of excess the regions of greatest departure are found on the northeastern portion of the North Carolina coast, in New Jersey, northern New England, and from Colorado and Wyoming westward to the Pacific. The departures of excess range from 0.01 to 0.16 inch, the largest being reported from Mount Washington. The principal area of deficiency in mean pressure is a very irregular one, and is found, rather anomalously, to follow very closely portions of the Mississippi and Missouri Rivers. Commencing with New Orleans, the departures of deficiency are found with regularity at every station until Cairo is reached, when a small area of slight excess is encountered, extending northward to the northern boundary of Iowa. Beginning again at Saint Paul, the departures of deficiency continue northward to Duluth and northeastward to Saint Vincent. On the Missouri the departures of deficiency begin at Leavenworth and continue without change to Fort Buford. Small areas of deficiency are found in southern Florida, southern California, and northeastern Oregon. The departures of deficiency range from 0.01 to 0.14 inch, the largest occurring at Saint Vincent. Stations reporting a normal condition are as follows: Davenport, Montgomery, Marquette, Saint Louis, and Wilmington.

Barometric ranges.—The range of pressure for the present month has generally varied from 0.75 to 1.2 inches, and in the extremes from 0.27 inch at Key West and 0.3 inch at Los Angeles to 1.24 inches at Fort Assinniboine, and 1.51 inches at Eastport. The ranges increase with the latitude on both the Atlantic and Pacific coasts, and from Florida and Southern California inward to the maximum in Texas. Throughout the several districts the monthly barometric ranges varied as follows: New England, from 1.33 inches at New London to 1.51 inches at Eastport; Middle Atlantic States, 1.09 inches at Lynchburgh to 1.3 inches at New York City; South Atlantic States, 0.62 inch at Jacksonville to 1.03 inches at Kitty Hawk. Florida Peninsula, 0.27 inch at Key West to 0.46 inch at Cedar Keys; Eastern Gulf States, 0.63 inch at New Orleans to 0.8 inch at Mobile; Western Gulf States, 0.6 inch at Galveston to 0.88 inch at Shreveport and 0.91 inch at Mason; Rio Grande Valley, 0.65 inch at Brownsville to 0.82 inch at Laredo and 0.84 inch at Brackettville; Ohio Valley and Tennessee, 0.79 inch at Nashville to 1.1 inches at Morgantown; Lower Lake region, 0.96 inch at Sandusky to 1.17 inches at Oswego; Upper Lake region, 0.93 inch at Chicago to 1.19 inches at Marquette; Upper Mississippi Valley, 0.85 inch at Des Moines to 0.95 inch at Madison; Missouri Valley, 0.81 inch at Omaha to 1.23 inches at Saint Vincent; Extreme Northwest, 1.13 inches at Moorhead to 1.23 inches at Fort Buford; Southern Slope, 0.59 inch at El Paso to 0.92 inch at Henrietta; Middle Slope, 0.64 inch at Pike's Peak to 0.91 inch at Fort Elliott; Northern Slope, 0.81 inch at Cheyenne to 1.23 inches at Fort Benton and 1.24 inches at Fort Assinniboine; Northern Plateau, 0.85 inch at Eagle Rock to 1.23 inches at Umatilla; Middle Plateau, 0.69 inch at Winnemucca to 0.74 inch at Salt Lake City; Southern Plateau, 0.43 inch at Florence to 0.6 inch at Camp Thomas and La Mesilla; South Pacific Coast region, 0.3 inch at Los Angeles and 0.31 inch at Campo to 0.49 inch at Visalia and 0.5 inch at Yuma; Middle Pacific Coast region, 0.46 inch at San Francisco to 0.99 inch at Red Bluff; North Pacific Coast region, 1.07 inches at Portland to 1.22 inches at Olympia.

Areas of high barometer.—Nine of the principal areas of high pressure for the month of December, 1881, appeared within the limits of the Signal Service weather maps and are described as follows:

No. I.—On the 1st of the month this area was central in Indian Territory, and extended rapidly to the northeast, the temperature falling from 10° to 20°; this fall was not sufficient, however, to reach the normal as the temperature on the morning of the 1st was above the normal from 10° to 20° in the districts east of the Mississippi River.

No. II.—Appeared over the Northern Slope on the morning of the 3d, it extended to the south during the day, to the northeast on the 4th, so that by the afternoon of the 5th the highest barometer was in New England. No decided fall of temperature resulted from this area, it remaining generally above the mean for the month.

No. III.—Appeared over Montana on the morning of the 6th; the next morning it was central in Kansas, on the 8th in Ohio, and on the 9th on the North Carolina coast. During the 6th the temperature fell over the Lake region and in the Upper Mississippi and Missouri Valleys from 10° to 20°, and by the morning of the 8th the cold wave extended to the Atlantic coast.

No. IV.—The morning map of the 8th showed an area of high barometer over Montana. The pressure increased and extended rapidly to the east during the day, and was accompanied by a fall of temperature of from 10° to 30°. On the morning of the 10th the barometer was highest in Indiana, the greatest rise (from 0.50 to 0.65 inch) occurring in the Saint Lawrence Valley. The fall in temperature followed closely the rise in the barometer, being 26° at Montreal and 30° at Rockcliffe in Ontario. During the 10th the center of the area moved eastward to the Atlantic coast, with a fall in temperature from Maine to Florida. The minimum temperatures for the month occurred at a large number of stations in New England and the Middle Atlantic States on the 11th. The pressure remained high on the Atlantic coast during the 12th and 13th.

No. V.—This area first appeared on the California coast on the 11th; during the day it moved to the northeast and on the morning of the 13th was central in Dakota, the temperature in last twenty-four hours having fallen from 10° to 30° west of the Mississippi River. The area of highest barometer was in Colorado and Kansas on the morning of the 14th, the pressure having increased 0.64 inch at Leavenworth in twenty-four hours. The temperature had fallen from 15° to 30° from the Lake region to Texas. On the 15th the highest barometer was in the Ohio Valley, and during the 16th, 17th, 18th, and 19th on the Middle and South Atlantic coasts. The minimum temperatures for the month occurred at several stations in New England and the Middle Atlantic States on the 16th.

No. VI.—A considerable rise of the barometer occurred in Oregon on the 15th; this increased pressure moved into the Extreme Northwest on the 16th, into Wyoming on the 17th, over the Lakes on the 18th, and over the Canadian maritime provinces on the 19th. On this date it joined with the high barometer that had existed along the Atlantic coast since the 16th. The passage of this wave of high pressure was accompanied by a fall of temperature of from 5° to 10°. The pressure did not at any time rise high enough to mark it as a center of high barometer, for during the entire time of its passage from Oregon to Halifax the highest barometer was either on the Middle or South Atlantic coast.

No. VII.—A wave of high pressure entered the United States over the Oregon coast on the 18th. The pressure to the eastward increased rapidly. On the morning of the 20th the highest barometer was in Montana. During the day it passed east of the Lake region, and northerly winds prevailed north of the 40th parallel. The center reached the Atlantic coast on the 21st, where the barometer remained highest until the 22d, when the pressure rapidly diminished.

No. VIII.—The morning map of the 22d showed an increased pressure from the Pacific coast to the Missouri River. During the day the increased pressure extended as far east as Lake Erie and from British America to the Gulf of Mexico. This extended area moved directly east to the Atlantic coast. The center of highest pressure was in the Ohio Valley on the 24th, and on the Middle Atlantic Coast on the 25th. The afternoon map of 24th showed a rise of 0.91 inch at New Haven and New York, and 0.94 inch at Delaware Breakwater in last twenty-four hours. Dangerously high winds prevailed on the Atlantic coast on the 23d and 24th.

No. IX.—During the 27th the barometer rose 0.7 inch in Washington Territory. During the 28th, this area of increased pressure covered the whole country west of the Mississippi River, the highest barometer being in Idaho. This extended area moved eastward, reaching the Atlantic coast on the 30th. On the 31st, the greatest rise occurred in the Canadian maritime provinces. The center of highest pressure was in Nebraska on the 29th and in Texas on the 30th. During the 31st the pressure fell rapidly in the Gulf States, and the center of highest barometer was transferred to the extreme northwest. On the 30th and 31st, the minimum temperatures for the month occurred in the Upper Mississippi and Missouri Valleys and at many of the stations in the Lake region and the Middle Atlantic States.

Areas of low barometer.—The paths of ten areas of low barometer are charted for the month of December, 1881. Six of these can only be charted approximately. In all the others the center passed within the limits of the observation offices of the Signal Corps.

No. I.—Is a continuation of No. XVI, described in the November Review. During the 15th it moved across New England and disappeared over the Gulf of Saint Lawrence accompanied by rain in New England and the Middle Atlantic States. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Wisconsin, 4th, in 48° 37′ N., 37° 17′ WNW., furious gale, heavy confused sea. 5th, in 47° 18′ N., 42° 39′ W., WNW., strong gale. Steamship City of New York, 4th, in 48° 45′ N., 40° 59′ W., strong NW. gale, very heavy head sea. Steamship Servia, 3d, in 46° 39′ N., 39° 25′ W., violent SW. to NW. gales and heavy squalls; 4th, in 44° 51′ N., 45° 12′ W., NW. squalls, with high sea. Steamship Anchoria, 3d, morning, in 48° 25′ N.; 42° 41′ W., 29.20 to 29.60, heavy NW. gale; afternoon, in 48° N., 43° 20′ W., 29.60 to 29.85, heavy westerly gale. 4th, in 47° 17′ N., 44° 22′ W., 29.89 to 29.94, WNW. and NW., strong gales with snow, very high sea.

No. II.—Was a slight depression, whose center can only be approximately located during the 4th. Cloudy weather and light snow prevailed during this day in the Lake region.

No. III.—This area first appeared in western Montana on the night of the 4th. It moved eastward during the 5th and 6th, causing southerly winds as far south as latitude 40° N. and accompanied by rain or snow. On the 7th high W. and NW. winds prevailed over the Lake region. A new depression appeared in the northwest on this date as the winds backed to the south. By the morning of the 8th the center had moved into New Brunswick. Cautionary signals ordered for this storm were justified by velocities ranging from 25 to 48 miles per hour. The following reports furnished through the co-operation of the New York Herald Weather Service indicate the presence of this storm as it passed eastward over the ocean: Steamship Switzerland, 8th, in 46° 49′ N., 45° 48′ W., 29.75, S. to W., force 4, overcast and rain. 9th, in 45° 50′ N., 49° 57′ W., 29.94, W. and NNW., strong gales, high head sea. 10th, in 44° 42′ N., 54° 14′ W., 29.99, WSW. to NNE., strong gales with snow.

No. IV.—Appeared in the extreme northwest on the afternoon of the 7th, and moved slowly eastward with very little precipitation and moderately high winds.

No. V.—Appeared in Upper Missouri Valley on the 11th. On the afternoon of the 12th the center was west of Lake Superior near Duluth, and by midnight had moved southwest into Iowa. It then moved off to the northeast and disappeared on the night of the 3d. During the passage of this storm, heavy and extensive rains occurred in New England, the Middle Atlantic States, and Lake region, and high winds prevailed in the Lake region and on the Atlantic coast.

No. VI.—Appeared in the extreme northwest. On the morning of the 15th it passed slowly eastward without rain or high winds, and on the 18th disappeared over the Canadian maritime provinces. The pressure fell below the normal at a few of the most northern stations only, and as it remained high in the southern portion of the United States a mass of warm and dry air was carried far north, the temperature rising from 10° to 25° above the normal at stations north of latitude 35° N.

No. VII.—This depression passed north of the Lake region on the 18th and 19th, unattended by marked atmospheric changes in the United States. The temperature and pressure both remained above the normal at all stations east of the Rocky Mountains and fair weather generally prevailed.

No. VIII.—This area, accompanied by heavy rain, moved up from the coast of Texas during the 19th, and on the morning of the 20th was central in Arkansas. By the next morning it had moved into northern Missouri and thence passed directly east and was central off the Atlantic coast on the morning of the 23d. The temperature remained above the normal and heavy rainfalls occurred in all directions east of the Mississippi. High winds prevailed over the Lake region and on the Atlantic coast. The following reports, furnished through the co-operation of the New York Herald Weather Service, indicate the presence of this storm as it passed eastward over the ocean: Steamship New York, 22d, in 38° 14′ N., 74° 25′ W., 30.22, ESE., light cross-sea, increasing gales with light rain; 23d, in 35° N., 75° 23′ W., 29.80, WSW., moderate gale, cloudy weather; 24th, in 33° 02′ N., 78° 25′ W., 30.31, NNE., fresh, clear, and fine weather. Steamship Gallia, 25th, morning, in 42° N. 50° 47′ W., 29.75, NW., force 8, high, confused sea, squally with rain and snow; noon, in 42° 46′ N., 51° 27′ W., 29.75, NW., force 8 to 9, high confused sea, squally with rain and snow; 26th, morning, in 41° 53′ N., 57° 28′ W., 30.43, W., force 4, dull, cloudy weather. Steamship P. Caland, 23d, in 44° 44′ N., 55° 51′ W., 29.81, SSW., force 5, squally, with rain; 24th, in 43° 28′ N., 60° 16′ W., 29.30, NE., force 9, squally with rain; 25th, in 41° 53′ N., 63° 39′ W., 30.42 NW., force 4, fine weather.

No. IX.—The midnight map of the 24th indicated a storm in the Gulf of Mexico. By the next afternoon its center was located near Port Eads. From this point its path is charted until the center had passed off the New Jersey coast on the 27th. This storm was accompanied by heavy rain. The temperature everywhere remained above the normal. The following high velocities are reported: Port Eads, E. 52 miles; Mobile, SE. 36; Pensacola, SE. 40; Jacksonville, SW. 27; Smithville, S. 40; Macon, SW. 46; Hatteras, E. 28.

No. X.—This area entered the United States in the extreme northwest from British America. On the 28th passed north of the Lake region and at midnight of the 29th was central between Oswego and Kingston. It then passed down the Saint Lawrence Valley and disappeared on the 30th. Rain fell in the Lake region, New England, and the Middle Atlantic States, and snow in the Lake region. After the center had passed to the eastward the barometer fell from 0.3 to 0.5 below the normal in the Lake region, and from 0.5 to 1.28 inches in New England and the maritime provinces of Canada. High winds prevailed in the Lake region and on the New England and Middle Atlantic coasts.

INTERNATIONAL METEOROLOGY.

International Charts Nos. IV and V accompany the present Review for December, 1881. The former is published for October, 1879, and continues the series of this chart commenced in January, 1877. Owing to the failure of receiving the October, 1879, number of the "Beobachtungen auf dem Nordatlantischen Ocean," kindly furnished this office through the courtesy of Prof. Dr. G. Neumayer, Director of the German Marine Observatory, Chart No. IV is not as complete over the North Atlantic Ocean as in previous months. Chart No. V is prepared for the month of January, 1880, and continues the series of this chart commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m. Greenwich mean time, for the month of October, 1879, over the northern, and at certain isolated stations in the Southern Hemisphere. The most decided area of barometric minima for the present month covers the southern half of Greenland and extends thence eastward between the parallels of 60° and 70° N. over northern Scandinavia and northwestern Russia. A second area of barometric minima covers the whole of British India and a portion of western Russia, the barometer falling below 29.90; elsewhere the pressure remains 30.00 or above except at certain isolated stations. Throughout the Northern Hemisphere north of 50° N. the barometer does not fall with regularity as the latitude increases, except between the meridians of 80° E. and 90° W., and again between 120° and 160° E., where there is not only a noticeable regularity in the fall northward, but also the presence of a marked rapidity. To break the continuity of this diminution of pressure in northern latitudes, two areas of high pressure push northward, one between the meridians of 80° and 120° E. and the other between 90° and 130° W. There are five principal areas of high pressure situated as follows: 30.25 in southern Siberia, 30.20 over the Azores, 30.20 in Tennessee and the southern portion of the Middle Atlantic States, 30.20 in the Northern Plateau, and 30.20 in central Mexico. There is a marked diminution of pressure over the Atlantic north of 30° N. and between the meridians of 30° and 60° W. as compared with September. A similar change has taken place over southern Russia. The extreme mean pressures for the month are 29.65 (lowest) at Tromsö and Stykkisholm, and 30.27 (highest) at Mexico and Nertschinsk. The extreme monthly range of mean pressure is 0.62 inch, which is 0.18 smaller than the range for October, 1877 and 1878, the range being the same (0.80 inch) for both the latter years.

The following extreme monthly mean temperatures are given in Fahrenheit's scale. lowest, York Factory, 26°; Nertschinsk, 29°; Godthaab, 31; Nikolaievsk on the Amoor, 33°; Yeniseisk, and Virginia City, 35°; Haparanda, Tromso, and Fort Garry, 37°; Fort Buford, 38°; Archangel, 39°; Stykkisholm and Barnaul, 41°; Moose Factory, 43°; highest, Deesa, 87°; Freetown, 85°; Kurrachee, 84°; St. Thomas, 83°; Bridgetown and Paramaribo, 82°; Macao, 81°; Nassau, Navassa, and Biskra, 80°; Fort de France, 79°. The prevailing direction of the winds over the United States was northeast to southeast south of parallel 40° N., and east of 100° W.; north of the above parallel and east of the same meridian, southerly, except westerly along the Atlantic coast; in the remaining portion of the country variable. Over Canada and in the maritime provinces, southwesterly. In central Mexico, calms. Over the Atlantic Ocean, northeasterly from the European coast westward to 30° W., and from the American coast eastward to 60° W.; between these meridians the directions are southeast, southwest, and northwest. In Europe westerly over the British Isles; northwesterly over Scandinavia and thence southward to parallel 40° N., except northeasterly in Italy and France; south of 40° N. variable, and in Russia southerly. In Hindostan, frequent calms with occasional winds, generally from the northwest. Over the Japan Islands and along the Asiatic coast, northeasterly. Compared with October, 1877 and 1878, the temperature over the United States is generally higher, particularly west of the 100th meridian, and the pressure shows a marked rise in the Atlantic Coast States and in the northern Rocky Mountain and Plateau districts. Over the Atlantic there is a decided rise in pressure off the Middle and South Atlantic coasts and in the vicinity of the Azores. The changes in temperature are very small and the tendency north of parallel 50° N. is a fall. In the various countries of Europe and Asia the following changes appear: in the British Isles the temperature is from 1° to 5° higher and the pressure from 0.18 to 0.4 inch lower. In France the temperature is slightly lower and the pressure from 0.01 to 0.15 inch higher. In Scandinavia the temperature is slightly lower and the pressure from 0.01 to 0.08 inch higher. In Germany the temperature shows but little change, while the pressure is from 0.01 to 0.17 inch higher. In Austria and Hungary the temperature is generally lower and the pressure generally higher. In Italy the temperature shows but little change, while the pressure is generally higher. In Spain and Portugal the temperature is slightly lower and the pressure is from 0.01 to 0.08 inch higher. In Algeria the temperature is from 1° to 4° higher and the pressure shows a rise of 0.01 to 0.05 inch. In Russia the temperature is generally higher, while the pressure is from 0.05 to 0.20 inch lower. In British India the temperature is from 1° to 4° higher, while the pressure generally shows very little change. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of October, 1879, as compared with the means of the past two years:

Comparative thermometric and barometric means, with corresponding departures.

Stations.	Mean temperature.			Mean barometer.		
	October, 1877–'78.	October, 1879.	Departure.	October, 1877–'78.	October, 1879.	Departure.
	°	°	°			
York Factory	22.1	26.1	+4.0	29.96	30.03	+0.07
Godthaab	30.2	30.7	+0.5	29.75	29.65	−0.10
Stykkisholm	37.4	41.4	+4.0	29.60	29.75	+0.15
Tromso	37.6	36.5	−1.1	29.58	29.65	+0.07
Thorshavn	46.2	45.7	−0.5	29.53	29.87	+0.34
Archangel	38.1	38.5	+0.4	29.79	29.72	−0.07
Ekaterinburg	41.1	44.8	+3.7	30.12	30.10	−0.02
Barnaul	37.6	40.5	+2.9	30.21	30.20	−0.01
Yeniseisk	30.8	35.1	+4.3	30.09	30.24	+0.15
Nikolaievsk on the Amoor	34.6	32.5	−2.1	....	....	....
Pekin	51.6	51.4	−0.2	30.17	30.21	+0.04
Zi-Ka-Wei	58.1	59.5	+1.4	30.17	30.20	+0.03
Tokei	57.6	56.5	−1.1	30.04	30.10	+0.06
Tashkend	54.3	55.8	+1.5	30.31	30.15	−0.16
Nukuss	55.3	61.2	+5.9	30.20	30.17	−0.03
Beirut	81.1	77.0	−4.1	29.90	29.99	+0.09
Mauritius	75.6	73.9	−1.7	30.08	30.12	−0.04
Fort Napier	76.5	73.5	−3.0	29.84	29,90	+0.06
Cape Town	68.8	66.6	−2.2	30.02	30.07	+0.05
Free Town	83.4	85.4	+2.0	29.93	29.92	−0.01
Paramaribo	80.7	82.1	+1.4	29.97	30.01	+0.04
Funchal	73.4	73.0	−0.4	30.10	30.10	Norm'l

Comparative thermometric and barometric means, with corresponding departures—**Continued.**

Station.	Mean temperature.			Mean barometer.		
	October, 1877-'78.	October, 1879.	Departure.	October, 1877-'78.	October, 1879.	Departure.
	°	°	°			
Ponta Delgado	69.2	72.1	+2.9	30.09	30.20	+0.11
Angra	66.1	68.7	+2.6	30.07	30.20	+0.13
Bridgetown	83.0	81.6	−1.4	29.93	29.96	+0.04
Navassa	81.5	80.0	−1.5	29.92	29.92	Norm'l
Medellin	66.1	65.2	−0.9	....	....	....
San José de Costa Rica	67.7	66.9	−0.8	....	....	....
Mexico	55.9	50.9	−5.0	30.15	30.16	+0.01
Melbourne	54.3	55.4	+1.1	30.01	29.97	−0.04
Hobart Town	51.0	56.0	+5.0	29.77	29.78	+0.01
San Juan de Puerto Rica	81.6	79.9	−1.7	29.90	29.98	+0.08
Nassau	79.8	80.2	+0.4	29.98	30.00	+0.02
Havana	79.3	79.0	−0.3	29.93	29.92	−0.01
Astrakhan	57.4	59.7	+2.3	30.20	30.14	−0.06
Athens	72.6	69.8	−2.8	30.03	30.02	−0.01
Lahore	81.7	82.4	+0.7	29.81	29.82	−0.02
Tiflis	64.9	67.3	+2.4	30.11	30.07	−0.04
Laghouat	72.3	75.0	+2.7	30.10	30.12	+0.02
Fort de France	81.6	79.2	−2.4	29.82	29.98	+0.16
Yokohama	59.8	59.6	−0.2	29.97	30.08	+0.11
Lisbon	67.8	66.0	−1.8	30.07	30.06	−0.01
Madrid	65.9	66.4	+0.5	....	....	....
Cagliari	70.3	70.7	+0.4	29.99	30.04	+0.05
Gibraltar	....	....	....	30.06	30.00	−0.06
Sandwick Manse	49.4	48.2	−1.2	29.63	30.01	+0.38
Malta	73.5	72.1	−1.4	30.00	29.99	−0.01

Chart No. V.—This chart displays the tracings of the probable courses of 22 of the principal storm areas of the Northern Hemisphere for the month of January, 1880. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways from the logs of vessels of the merchant marine of the North Atlantic and North Pacific Oceans. Concerning the general distribution of the paths of the areas of barometric minima the following is given: fifteen areas traversed portions of the United States, eight of which came from the Pacific Ocean, three from the British Possessions, one from the Gulf of Mexico, and one a continuation of area No. XXXII of the December, 1879, chart. Twelve of these areas reached the Atlantic Ocean, five of which crossed the same to the mainland of northern Europe and one passed southeastward from Newfoundland to the northwestern coast of Africa. Over the Atlantic Ocean one area appears in about 60° N., 20° W., as a continuation of area No. XXX of the December, 1879, chart. In Europe four areas first appeared off the northwestern coast of Norway and one in southwestern Russia. Off the Asiatic coast one area passed northeastward south of the Japan Islands. Of the storms in North America the following detailed descriptions are given: No. I.—This area is a continuation of No. XXXIV of the December, 1879, chart. Passing rapidly eastward from the Pacific coast during the 31st of December, 1879, the depression was central in Manitoba on the following day, January 1st, 1880. Fort Garry, 29.31, a fall of 0.73 inch in past twenty-four hours, S., clear; Fort Buford, Montana, 29.20, a fall of 0.74 inch, SW., clear; Pembina, Dak., 29.26, a fall of 0.76 inch, S. fair. 2d, depression central over northern Canada inclosed by the isobar of 29.60; Moose Factory, James Bay, 29.60, a fall of 0.39 inch, wind shifted from SW. to NW., with stormy weather. During the day the depression passed rapidly eastward to the Atlantic Ocean, combining with area No. II on the 3d. The following reports from Godthaab, Greenland, indicate the influence of this depression north of its center: 2d, 29.41, ENE., force 2, cloudy; 3d, 29.17, NE., force 4, cloudy; 4th, 29.36, NW., force 4, cloudy; 5th, 29.[illegible] N., force 4, fair; 6th, 29.67, NW., force 2, clondy. The low barometers of the 1st and 2d at Godthaab were due to the influence of area No. XXX of the December, 1879, chart, from which the surrounding pressure had not completely recovered before the passage of areas Nos. I and II. No. II.—This area is charted as a continuation of area No. XXXII of the December, 1879, chart. On the 1st, central southeast of Nova Scotia, followed to the westward over New England and in the Canadian maritime provinces by winds shifting to northwesterly with rapidly rising pressure. In 45° N., 58° W., 29.67, NE., force 6, rain; Sydney, N. S., 29.72, NE., heavy snow; Charlottetown, 29.76, W., heavy snow; Saint Pierre, N. F., 29.72, E., snow; Little Glace Bay, N. S., 29.64, NE., heavy snow; in 40° 40′ N., 65° 05′ W., N. S., and NW., variable winds, confused sea, heavy storm; in 45° 30′ N., 50° 20′ W., SSW. to NNW., heavy gale, terrific squalls; 2d, depression central in about 50° N., 40° W.; in 46° 03′ N., 41° 42′ W., 29.53, NW., force 7, high sea and rain; in 49° 50′ N., 30° 45′ W., 29.19, SW., force 9, high sea and rain; in 44° N., 55° W., SW. to NW., severe gales, high sea; in 46° 29′ N., 39° 39′ W., SW. to NW., hard gales, hail and rain, high confused sea; in 48° 25′ N., 33° 45′ W., NW. to SW., hard gales, high cross-sea; in 47° N., 28° W., hurricane from SW., lost boat and davits; in 49° 50′ N., 27° 06′ W., WNW. to WSW., rain, high westerly sea. During the 3d and 4th the depression passed northeastward to Iceland, being central on the 5th north of Stykkisholm. The following observations were reported from this station during the approach and passage of the depression: 3d, 29.10, SE., force 7; 4th, 28.91, S.-force 8, rain; 5th, 29.04, SW., force 4, snow; 6th, 29.77, S., force 5, rain. During the 6th the depression entered the northwestern coast of Norway; Tromso, 29.54, a fall of 0.27 inch in past twenty-four hours, SW., rain. 7th, depression central, with diminished energy over Lapland; Haparanda, 29.81, a rise of 0.07 inch, wind shifted to west; Archangel, 29.67, a fall of 0.31 inch, S., cloudy. During the day the course of the depression changed from east to south, and on the morning of the 8th i was central between the Gulf of Finland and the White Sea. St. Petersburg, 29.59, a fall of 0.21 inch, SSE., cloudy; Archangel, 29.65, a fall of 0.02 inch, SE., cloudy; Dorpat, 29.45, a fall of 0.53 inch, SSW., cloudy. Continuing its southerly course the depression was central north of the Black Sea on the 9th. Kieff, 29.63, a fall of 0.37 inch, N., snow; Nikolaiev, 29.52, a fall of 0.50 inch, W. 45 miles, snow; Lugan, 29.62, a fall of 0.28 inch, E., cloudy; Astrakhan, 29.91, a fall of 0.10 inch, calm, cloudy. During the day the course of the depression changed to the east, and on the following morning it was central, with diminished energy, between the Black and Caspian Seas. Kieff, 30.25, a rise of 0.62 inch, NW., clear; Nikolaiev, 30.17, a rise of 0.65 inch, NNW., clear; Lugan, 29.67, a rise of 0.05 inch, E., cloudy; Astrakhan, 30.00, a rise of 0.09 inch, SE., cloudy. During the 10th and 11th, the depression disappeared over Toorkistan in a high pressure area, 30.25. No. V.—This area entered the Pacific coast on the 2d, in latitude 50° N., accompanied in British Columbia by easterly gales with sleet and snow, and to the southward, in Washington Territory and Oregon, by southeast to southwest winds and rain. During the day the depression moved rapidly eastward to the Saskatchewan Valley, attended by comparatively light precipitation. 3d, central in Manitoba; Fort Garry, 29.50, a fall of 0.75 inch, S., fair; Fort Buford, Montana, 29.39, a fall of 0.26 inch, W., cloudy. Continuing its easterly course, the depression was central east of James Bay on the 4th; Moose Factory, 29.56, a rise of 0.08 inch, W., cloudy. During the 4th and 5th the course of the depression, as indicated upon the chart, is rather doubtful, owing to the lack of reports from the region north of 50° N. The following report from Saint John's, Newfoundland, on the 5th, indicates the presence of this depression north of Newfoundland on that date; barometer, 29.57, a fall of 0.95 inch, W., snow. 6th, depression central in about 50° N., 40° W.; in 45° 43′ N., 45° 07′ W., SW. to NW. and N., moderate gales, squalls of rain, high westerly sea; in 49° 18′ N., 37° 13′ W., WNW., strong gale, high westerly sea; in 43° 16′ N., 51° 02′ W., NNW., heavy gale, high westerly sea; in 47° 24′ N., 40° 38′ W., SW. to WNW., strong gale, very high sea; in 48° N., 34° W., E. to SW. and NW. moderate, increasing to strong gales. 7th, in 44° 29′ N., 46° 47′ W., NNW. and W., strong gale with violent squalls of snow; in 47° 26′ N., 44° 12′ W., N., strong gale, high sea; in 46° 22′ N., 45° 40′ W., SW. to WNW., strong gale, high sea; in 46° 26′ N., 39° 27′ W., NW., fresh gale, very high sea; in 49° 21′ N., 27° 58′ W., S. to NW. strong gale, vessel hove to for three hours. During the approach and passage of this storm the following observations were reported from Stykkisholm, Iceland: 6th, 29.77, S., force 6, rain; 7th, 29.37, S., force 8, rain; 8th, 29.74, S., force 7, rain; 9th, 29.70, SE., force 7, cloudy. The following observations were reported from Godthaab, Greenland: 5th, 29.43, N., force 4, fair; 6th, 29.67, NW., force 2, cloudy; 7th, 29.06, NE., force 6, fair; 8th, 29.15, NNE., force 4, fair; 9th, 29.69, NNE., force 4, fair. So far as can be judged from the daily charts, the atmospheric conditions at Godthaab indicated that the preponderating influence of area No. V began on the 5th, while area No. II was central north of Stykkisholm. By the morning of the 10th, with considerably diminished energy, this depression had reached the northern coast of Norway. 11th, depression probably central over the Arctic Ocean north of Lapland; at Haparanda the barometer rose to 30.33, with southerly winds, but fell slightly at Tromso, with a southwest wind. 12th, central east of the White Sea; Archangel, 29.47, a fall of 0.88 inch, winds shifting from south to west, with snow. During the day the depression disappeared to the eastward. No. VII.—This area appeared off the North Pacific coast on the 4th, attended by very heavy southeasterly gales, with rain and snow in British Columbia, and southerly winds with rain in Oregon and Washington Territory, changing to snow in the northern portion of the latter as the depression passed eastward. 5th, central in the Saskatchewan Valley; during the day moved eastward to the region between Lake Superior and James Bay, where it was central on the following morning. 6th, Moose Factory, 29.50, a fall of 1.12 inches, SW., cloudy; York Factory, 30.12, a rise of but 0.01 inch, wind steady from the NW. since the 4th. During the 6th, this depression moved rapidly northeastward, crossing the Labrador Peninsula, and thence reaching the Atlantic Ocean at the entrance of Davis's Straits, where it was probably central on the morning of the 7th. The course of the area since leaving the Province of Ontario is quite doubtful, owing to the lack of reports from this portion of North America, but the following observations reported from Godthaab indicate the approach of the depression with considerable certainty: 6th, 29.67, NW., force 2, cloudy; 7th, 29.06, NE., force 6, fair; 8th, 29.15, NNE., force 4. The pressure at Godthaab remained very low from the 1st to the 12th of the month, owing to the frequent passage of areas of barometric minima northeastward between Greenland and Iceland. The atmospheric equilibrium had not time to recover before the appearance of another area of disturbance, thus rendering it difficult to mark the interval showing the particular effect of each separate depression. During the 7th this depression probably moved northeastward and combined with area No. V, then central over the ocean west of Iceland. No. VIII.—The approach of this depression on the North Pacific coast followed closely the disappearance of area No. VII. On the 6th the winds in British Columbia shifted rapidly from SW. to NE. and N., accompanied by remarkably heavy snow, at some places reaching a depth of 10 feet, causing considerable loss of property, and interrupting all communication. Throughout Oregon and Washington Territory, southerly winds with rain, changing to snow in the former, prevailed. 7th, lowest barometer at Olympia, 29.13, or 0.82 inch below the normal. The winds increased from brisk to high, accompanied by heavy precipitation. 8th, depression central in Western Dakota; Virginia City, Mont., 29.13, a fall of 0.43 inch. SW., clear; Fort Buford, 29.25, a fall of 0.61 inch, calm, cloudy. During the day the depression passed southeastward into Minnesota, being central on the 9th in western Wisconsin; La Crosse, 29.42, a fall of 0.53 inch, W., light rain; Madison, Wis., 29.40, a fall of 0.60 inch, S., dense fog; Marquette, 29.48, a fall of 0.57 inch, SE., light rain. The depression moved rapidly northeastward during the day and by the morning of the 10th became central in the Lower Saint Lawrence Valley; Farther Point, 29.65, a fall of 0.79 inch, NE., threatening; Chatham, 29.83, a fall of 0.81 inch, calm, foggy; threatening weather and rain, with southeasterly winds and falling barometer, prevailed throughout the Canadian maritime provinces. 11th, depression central off the Banks of Newfoundland. Saint John's, Newfoundland, 29.83, a fall of 0.73 inch, W., fair. Throughout the Canadian maritime provinces the winds shifted to west and northwest, with clear or fair weather and rapidly rising barometer. The depression now changed its course to the southeast and moved very slowly towards the Azores. Its dilatory movement, as indicated upon the chart, was probably due to the persistent high pressures which prevailed off the coasts of France and Spain, and continued without relief until the 21st. From the 2d to the 19th the pressure over the Atlantic in the vicinity of the Bermudas remained very high, ranging from 30.30 to 30.60. 12th, in 50° N. 40° W., 29.29, NE., force 4, fair; in 43° N., 57° 36′ W., N., stormy; in 41° 15′ N., 30° 20′ W., 29.81, NW., force 2, fair. 13th, in 50° 26′ N., 37° W., NE., moderate to high gales; in 41° 55′ N., 28° 40′ W., 29.71, SSE., force 6, rain; in 48° 40′ N., 47° 30′ W., 29.95, NNE., force 5, fair; Ponta Delgado, 29.99, a fall of 0.27 inch, wind shifted from N. 2 miles per hour to SSW. 20 miles. 14th, in 43° 55′ N., 26° 25′ W., 29.88, SE., force 5, light rain; northeasterly gales prevailed in the vicinity of 50° N., 40° W.; in 48° 20′ N., 51° 30′ W., 29.71, S., snow; Ponta Delgado, 29.99, S. 41 miles, cloudy. 15th, in 44° 45′ N., 56° W., NW., stormy, very high sea, extremely cold; in 47° 16′ N., 52° 40′ W., 29.86, NNE., force 5, cloudy; Ponta Delgado, 29.93, S. 28 miles, cloudy. 16th, in 35° 10′ N., 46° 45′ W., 29.92, NW., force 6, cloudy; in 46° 35′ N., 22° 10′ W., 29.91, E., force 5, cloudy; in 40° 52′ N., 20° 29′ W., 29.99, S., force 4, light rain; Ponta Delgado, 29.87, SW. 18 miles, partly cloudy. 17th, in 36° N., 43° 05′ W., 29.92, NW., force 6, cloudy: in 47° 30′ N., 21° 30′ W., 29.75, E., force 6, rain; in 38° 50′ N., 24° 42′ W., 29.68, SSW., force 4, cloudy; Ponta Delgado, 29.62, S. 27 miles, light rain. 18th, in 36° 10′ N., 39° 25′ W., 29.69, NW., force 7, severe squalls; in 48° 50′ N., 21° 30′ W., 29.79, E., force 8, cloudy; in 49° 51′ N., 41° 49′ W., 29.84, N., force 5, cloudy; in 37° 18′ N., 28° 04′ W., 29.54, W., force 6, high sea, cloudy; Ponta Delgado, 29.60, SW. 35 miles, partly cloudy; 19th, in 35° 20′ N., 36° 30′ W., 29.68, NW., force 6, light showers; in 48° 25′ N., 22° 25′ W., 29.80 E., force 7, cloudy; in 45° 15′ N., 17° 25′ W., 29.68, E., force 6, cloudy; in 35° 16′ N., 31° 26′ W., 29.45, NW., force 7, high cross-sea, heavy rain; Ponta Delgado, 29.39, SSW. 11 miles, partly cloudy. 20th, in 35° 55′ N., 33° 35′ W., 29.62, NW., force 4, cloudy: in 47° 25′ N., 22° 30′ W., 29.62, ENE., force 6, rain; in 45° 15′ N., 21° W., 29.58, ESE., force 4, cloudy; Ponta Delgado, 29.38, W. 1 mile, fair; Funchal, 29.84, a fall of 0.03 inch, WSW., cloudy. 21st, in 48° 05′ N., 22° 10′ W., 29.92, ESE., force 3, cloudy; in 45° 10′ N., 24° 05′ W., 29.84, E., force 4, light rain; in 36° 50′ N., 30° 40′ W., 29.80, NNW., force 5, cloudy; in 28° N., 15° 30′ W., 29.92, SSE., force 3; Ponta Delgado, 29.59, calm; Funchal, 29.82, SSW. cloudy. 22d, in 37° 15′ N., 28° 50′ W., 29.97, NE., force 4, cloudy; in 28° N., 15° 30′ W., 29.92, SSE., force 3; Ponta Delgado, 29.90, NE. 4 miles, light rain; Funchal, 29.84, WSW., cloudy. 23d, Ponta Delgado, 30.12, NE. 3 miles, fair; Funchal, 29.95, SW., fair. 24th, Ponta Delgado, 30.30, NE. 10 miles, fair; Funchal, 30.08, SW., clear. During the 22d and 23d the depression slowly disappeared off the northwestern coast of Africa. No. IX.—The manner of approach of this depression on the North Pacific coast resembled that of the previous areas, Nos. V, VII, and VIII, but proved to be by far the most severe. During the 9th, while the depression was central off the Oregon coast, violent southeast to southwest gales with tremendous sea were experienced and the barometer reached a minimum of 28.20. As the depression passed eastward over Oregon the barometer fell below 29.00, and wind velocities of from 50 to 80 miles per hour were recorded. In this State the destruction of property was very great, the loss being variously estimated at from $200,000 to $400,000. North of the storm center, in British Columbia, Washington Territory, and Montana, northerly gales with heavy snow prevailed, while to the southward, in Idaho and the northern portions of California and Nevada, southerly gales with rain prevailed. The fall of snow accompanying this storm was, in many instances, reported to be the heaviest ever known. 10th, depression central in western Dakota; Fort Buford, Dak., 28.89, a fall of 1.13 inches, calm, cloudy; Bismarck, 29.14, a fall of 0.90 inch, SE., cloudy; North Platte, 29.15, a fall of 0.59 inch, SE., clear. 11th, central over Lake Superior; Marquette, 29.37, a fall of 0.85 inch, S., light rain; Escanaba, 29.38, a fall of 0.88 inch, S., cloudy; York Factory, 29.28, a fall of 0.77 inch, W., snow; Moose Factory, 29.76, a fall of 0.52 inch, S., cloudy. 12th, probably central east of James Bay, disappearing during the day to the eastward, possibly combining with area No. VII. No. X.—Following the passage of area No. IX eastward over the Lake region, this depression formed over Texas as the northerly winds of an approaching high area swept southward. 12th, depression central in Mississippi, with slight energy, and during the day passed rapidly northeastward over Tennessee and the Ohio Valley to the Atlantic. 13th, central over the ocean east of the Middle Atlantic coast; in 40° 23′ N., 70° 50′ W., NE. gales. During the 14th the depression probably merged with area No. VII, then central in about 45° N., 35° W.; the rapid movement of this area, together with its slight energy, was probably due to the swift advance from the northwest of an area of high pressure, 30.40, which, by the morning of the 14th, embraced almost the entire Atlantic coast. No. XII.—This depression appeared off the coast of British Columbia on the 12th. Southeasterly winds increasing to gales, with heavy snow prevailed throughout that territory. Southerly winds with rain, changing to snow, prevailed in Oregon and Washington Territory. At New Westminster the barometer fell to 29.36. 13th, depression central in Montana; Virginia City, 29.44, a fall of 0.36 inch, SW., cloudy. Heavy gales accompanied this depression in the Rocky Mountain regions; Fort Fetterman, Wyo., W. 40 to 59 miles per hour; Cheyenne, W., 42; Fort Custer, Mont., SW., 28; Pike's Peak, NW., 50. 14th, depression central north of Lake Superior; Marquette, 29.53, a fall of 0.95 inch, SW., clear; Moose Factory, 29.66, a fall of 0.76 inch, S., cloudy; York Factory, 29.88, barometer stationary, S., snow. During the day the depression disappeared north of Canada. No. XIII.—This depression probably entered the coast of British Columbia early on the morning of the 14th, as heavy southeasterly gales with snow were reported from the southern portion of that territory. 15th, depression central in the Saskatchewan Valley, accompanied by southerly winds and rain or snow southward over Dakota and Montana; Fort Buford, 29.16, a fall of 1.02 inches, SW., cloudy; Fort Garry, 29.60, a fall of 0.66 inch, S., hazy. 16th, depression central, with diminished energy in northern Minnesota; Saint Paul, 29.71, a fall of 0.35 inch, SE., cloudy. During the day the depression moved slowly northeastward between Lake Superior and James Bay, being central on the 17th north of Lake Huron; Alpena, 29.70, a fall of 0.10 inch, SE., light fog; Marquette, 29.68, a fall of 0.08 inch, NW., light snow. The course of the depression now changed to the southeast, and by the morning of the 18th it was central in New York. Throughout the Saint Lawrence Valley, north to west winds with threatening weather and rain prevailed; pressure generally below 29.90. During the day the depression passed eastward off the New England coast followed by winds shifting to northwest with clear or clearing weather, but slowly rising barometer. 19th, depression central south of Nova Scotia, accompanied in the Canadian maritime provinces by brisk to high northerly winds, with rain, sleet, and snow. Little Glace Bay, N. S., 29.41, a fall of 0.58 inch, calm, rain; Halifax, N. S., 29.42, a fall of 0.60 inch, N., heavy snow; in 40° 28′ N., 60° 50′ W., 29.41, SW., force 6, light rain; in 41° 11′ N., 66° 59′ W., 29.67, NNE., force 5, cloudy, heavy rain in past twenty-four hours. During the 20th and 21st the depression remained about stationary south of Newfoundland. Lack of sufficient ocean data on these two dates renders the movement of the area, as charted, somewhat uncertain. 22d, depression central off the Banks of Newfoundland; Saint Johns, 29.75, a fall of 0.51 inch, S., cloudy; in 45° 53′ N., 52° W., 29.53, W., force 5, rain; in 42° 49′ N., 53° 18′ W., 29.90, NW., force 2, cloudy, twelve hours' rain in past twenty-four hours. During this day and the following, the depression passed northeastward to near parallel 60° N., where on the 24th it was central. The following observations were reported from Stykkisholm, Iceland, during the approach and passage of the depression: 24th, 29.48, a fall of 0.62 inch, S., cloudy; 25th, 29.04, SW., snow; 26th, 28.71, W., snow; 27th, 28.84, SW., snow; 28th, 28.81, SW., snow; 29th, 29.19, W., snow. From the 25th to the 28th the depression appeared to remain about stationary in the vicinity of Iceland, owing perhaps to the exceedingly high pressures, 30.30 to 30.60, over central and northern Europe. The following observations were reported from Godthaab: 24th, 29.60, ENE., cloudy; 25th, 29.24, N., cloudy; 26th, 29.53, N., snow; 27th, 29.76, ENE., fair. 29th, depression central off the northwestern coast of Norway; Tromso, 28.81, a fall of 0.51 inch, SW., cloudy; Brono, 29.42, a fall of 0.25 inch, SW., cloudy; Haparanda, 29.32, a fall of 0.29 inch, W., cloudy. During this day and the following, the depression disappeared north of Lapland. No. XIV.—This depression probably entered British Columbia from the Pacific Ocean during the 15th, but from the lack of sufficient reports its course cannot be clearly charted. 17th, central in the Saskatchewan Valley; Fort Buford, Dak., 29.33, a fall of 0.09 inch, S., fair; Fort Garry, 29.83, a rise of 0.03 inch, SE., cloudy. 18th, central in northern Minnesota, lowest barometer (29.55) still at Fort Buford, wind shifted to W. Owing to the rapid advance of a high pressure area (30.40) from the Saskatchewan Valley, and the existence of another high area (30.25) in the Eastern Gulf, the depression on the 19th formed a barometric trough reaching from the Lower Lakes southwestward to New Mexico. During the day this elongated area contracted and became central as a small depression in the Ohio Valley on the 20th, lowest barometer at Indianapolis, 29.55, a fall of 0.33 inch, W., threatening. By morning of the 21st the depression had passed off the Middle Atlantic coast, and was central south of Nova Scotia. Yarmouth, 29.39, a fall of 0.57 inch, SE., cloudy; St. John, N. B., 29.55, a fall of 0.41 inch, NE., snow; Halifax, 29.64, a fall of 0.29 inch, E., heavy rain; in 41° 26′ N., 60° 53′ W., 29.72, SSE., force 6; Eastport, Me., 29.49, a fall of 0.43 inch, NE., sleet; Portland, Me., 29.62, a fall of 0.27 inch, N., snow. During the day the depression passed northeastward and combined with area No. XIII, then central off the Banks of Newfoundland. No. XIX.—This depression appeared off the coast of British Columbia on the 24th, and passed rapidly eastward over that territory, and thence southeastward to Montana, where it was central on the morning of the 25th. Virginia City, 29.09, a fall of 0.37 inch, SW., threatening; Fort Buford, 29.03, a fall of 0.70 inch, calm, cloudy; Bismarck, 29.42, a fall of 0.50 inch, S., cloudy. 26th, depression central in northern Minnesota; Duluth, 29.36, a fall of 0.48 inch, calm, cloudy; Saint Paul, 29.38, a fall of 0.38 inch, S., cloudy. During the day the depression disappeared over northern Canada. No. XX.—This depression, probably of cyclonic origin, first appeared over the Caribbean Sea, northeast of the Yucatan Peninsula, on the 25th. Along the northern and eastern Gulf coasts the pressure fell steadily from the 23d, winds shifting to northeast with occasional rain. Throughout the West Indies, north of parallel 20° and west of the 70th meridian, the pressure fell quite generally on the 25th, winds shifting from south to east with occasional rain. In 21° 50′ N., 74° 05′ W., 29.89, a fall of 0.14 inch, in past twenty-four hours, E., force 4, showery; Nassau, Bahamas, 29.94, a fall of 0.06 inch, SE., cloudy; Havana, Cuba, 29.87, a fall of 0.06 inch, SSE., clear; Key West, 29.88, a fall of 0.05 inch, S., fair; Punta Rassa, 29.85, a fall of 0.11 inch, NE., foggy. 26th, Key West, 29.79, S., threatening; Havana, 29.80, S., rain; Punta Rassa, 29.73, SE., light rain. During the day the depression passed northeastward over Florida, and by the following morning was central off the South Carolina coast. 27th, Charleston, 29.69, a fall of 0.25 inch, NE., cloudy; Wilmington, 29.77, a fall of 0.24 inch, E., light rain, 2.35 inches in past twenty-four hours. Along the North Carolina coast the winds shifted to northeasterly with heavy rain. 28th, depression central near 40° N., 70° W. Along the Middle Atlantic coast the winds shifted from NE. to W. and NW., with falling barometer and rain. In 38° 18′ N., 73° 28′ W., 29.75, WNW., force 3, foggy; in 34° 29′ N., 72° 56′ W., 29.95, S., force 3, light rain. This storm developed but slight energy along the Atlantic coast, or even over the ocean, so far as can be judged from reports at hand. During the 28th the depression combined with area No. XXII, then central off the Banks of Newfoundland. No. XXII.—As area No. XIX passed eastward over the Lake region on the 26th, a slight depression formed to the southward in Texas, which by the following morning had gradually developed into an extensive barometric trough, reaching from Michigan southwestward to New Mexico. During the day the depression moved rapidly northeastward over the Ohio Valley and Lower Lake region, and by the morning of the 28th was central in northern New England. On this day area No. XX being central over the ocean east of the Middle Atlantic coast, the two depressions were in about the same meridian and formed a barometric trough extending south from Labrador to about 35° N.; Chatham, 29.69, a fall of 0.51 inch, S., light rain; Dalhousie, N. B., 29.67, a fall of 0.49 inch, W. cloudy. Rain, with a fall in pressure of from 0.20 to 0.50 inch generally prevailed throughout the Canadian maritime provinces.

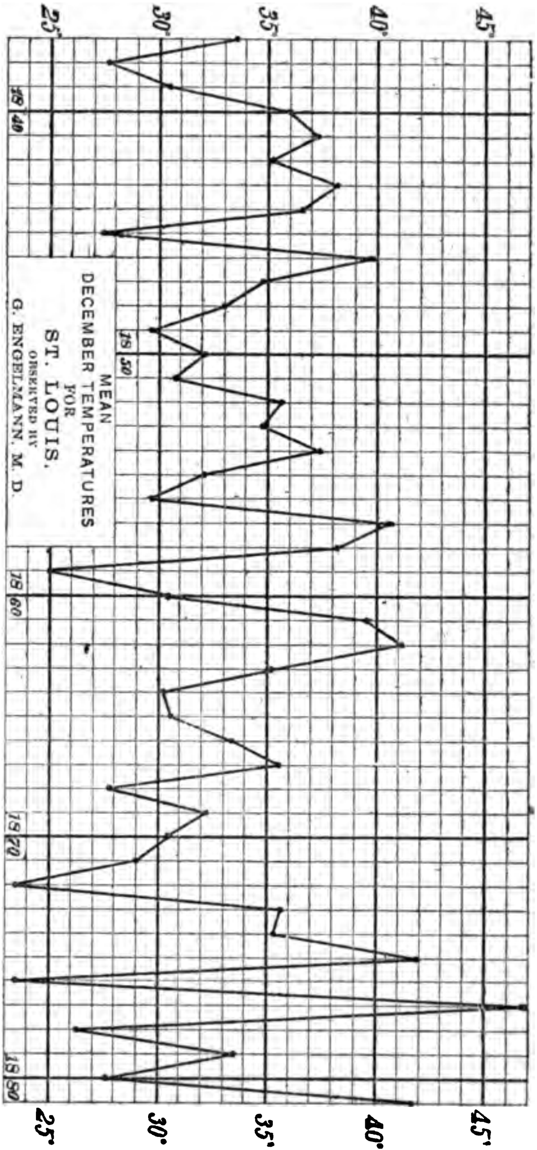
29th, after combining with area No. XX the depression became central off the Banks of Newfoundland, followed over the maritime provinces by winds shifting to northwesterly with clear and clearing weather. Saint Johns, Newfoundland, 29.56, a fall of 0.63 inch, SW., cloudy; in 48° 15′ N., 43° 19′ W., 29.15, WSW., force 7, very heavy westerly sea, light rain; in 40° 35′ N., 48° 40′ W., 29.83, SW., force 9, very heavy westerly sea. During the day the depression moved northeastward between the parallels of 50° and 60° N., and on the morning of the 30th was central with greatly increased energy in about 60° N., 30° W. The central area of low was inclosed by the isobar of 28.40, while the isobar of 29.80 passed southeastward from the northeastern coast of Labrador to about 37° N., 40° W., and thence northeastward to the White Sea, embracing 30° of latitude and about 90° of longitude. Over the Canadian maritime provinces the pressure rose rapidly from 0.30 to 0.70 inch with northwesterly winds; between the meridians of 20° and 40° W. and near the parallel of 50° N. the barometer fell to 29.20, with westerly winds; over the northwestern portion of the British Isles the pressure fell from 0.10 to 0.25 inch, with southwesterly winds and rain. During the approach and passage of the depression the following observations were reported from Stykkisholm, Iceland: 29th, 29.19, W., force 6, snow; 30th, 28.34, SE., force 10, rain; 31st, 28.67, SE., force 4, snow. The following observations were reported from Godthaab, Greenland: 28th, 29.45, ENE., force 4, cloudy; 29th, 28.88, NNE., force 4, fair; 30th, 28.91, NE., force 8, snow; 31st, 29.01, NNE., force 4, fair. No. III.—Although this area, as indicated upon the chart, first appeared over the ocean, it cannot be considered as developing there, it being but a continuation of area No. XXX of the December, 1879, chart. Central morning of the 1st in about 60° N., 25° W., the depression moved rapidly northeastward to the Norwegian coast. On this day the central area of low was inclosed within the isobar of 28.40, while the isobar of 29.80 inclosed the whole of northern Europe, and thence westward over the ocean north of parallel 50° N. to the meridian of 40° W. The pressure over the British Isles ranged from 29.00 to 29.90, with southwesterly winds increasing to gales, accompanied by squalls of rain or snow, with occasional hail. The following observations were reported from Stykkisholm, Iceland, during the approach and passage of the depression: 1st, 28.39, NE., force 6, snow; 2d, 29.21, N., force 8, snow; 3d, 29.10, SE., force 8, cloudy. The following observations were reported from Godthaab, Greenland: 1st, 29.15, ENE., force 2, cloudy; 2d, 29.41, ENE., force 4, cloudy; 3d, 29.17, NNE., force 4, cloudy. 2d, depression central north of the Shetland Islands. Thorshavn, 28.62, W., force 8, rain and hail; North Unst, 28.97, W., force 8, cloudy; Bergen, 29.30, SW. 34 miles per hour, sleeting; Brono, 28.79, SW. 27 miles, cloudy; Christiana, 29.30, WSW., cloudy; Tromso, 28.71, SW., cloudy; Haparanda, 29.11, S., force 6, snow; Umea, 29.07, S., force 8, cloudy; Hernosand, 29.10, S., force 6, cloudy; 3d, depression central over northern Sweden; Haparanda, 28.86, SW., force 2, cloudy; Umea, 28.98, SW., force 2, fair; Hernosand, 29.02, SSW., force 2, fair; Stockholm, 29.24, WSW., force 4, light rain; Tromso, 28.69, NW., cloudy; Bergen, 29.61, NNW. 28 miles, sleet; Brono, 29.07, NNW. 27 miles, rain; Archangel, 29.18, a fall of 0.66 inch, SSE., cloudy. 4th, depression slowly filling up over Lapland with clearing weather to the westward in Scandinavia. During the 5th and 6th the depression gradually disappeared over northern Russia, accompanied by southerly winds and cloudy weather throughout the central and northern portions of that country. Concerning the storms over Europe the following detailed descriptions are given: No. IV.—On the 1st the pressure over the central portion of southern Russia was generally below 29.80, the lowest barometer being reported from Nikolaiev, 29.67, a fall of 0.43 inch, calm, foggy; Kieff, 29.72, a fall of 0.14 inch, NW., cloudy; Lugan, 29.84, a rise of 0.04 inch, SE., cloudy. 2d, depression moved slowly southeastward; Kieff, 29.72, N., cloudy; Nikolaiev, 30.12, a rise of 0.45 inch, NNW., cloudy; Lugan, 29.87, calm, cloudy. During the day the depression passed southeastward over the Black Sea and on the 3d disappeared over Turkey; Beirut, 29.82, a fall of 0.33 inch, wind shifted from SSW. to WNW., light rain during the past eight hours. No. XI.—This depression first appeared off the northwestern coast of Norway on the 12th, following closely the disappearance of No. V, to the eastward; Tromso, 29.97, NE., cloudy; Brono, 30.21, WSW., 18 miles per hour, rain and snow. 13th, depression central over Lapland with greatly increased energy; Tromso, 29.21, NNE., cloudy; Brono, 29.65, NW. 22 miles, cloudy; Haparanda, 29.40, W., fair; Archangel, 29.35, W., cloudy. During the day the depression changed its course to the southward, and by the morning of the 14th was central near the Gulf of Finland; St. Petersburg, 29.20, a fall of 0.55 inch, S., cloudy; Dorpat, 29.27, a fall of 0.63 inch, SW., fair; Archangel, 29.22, E., cloudy; Haparanda, 29.38, N., fair; Umea, 29.43, N., fair. During the day the depression passed slowly southeastward over the Gulf of Finland, and by the morning of the 15th was central north of Moscow, barometer 29.56, S., fair; St. Petersburg, 29.26, NE., snow; Dorpat, 29.34, WNW., light snow; Archangel, 29.39, ENE. fair; Kasan, 29.87, SSE., snow; Krotkowo, 30.04, S., snow. 16th, depression about stationary, probably owing to the high pressures over southeastern Russia, western Siberia and in Toorkistan. St. Peter sburg, 29.59, NNW., snow; Dorpat, 29.65, W., light snow

Moscow, 29.73, SW., cloudy; Archangel, 29.44, SE., cloudy; Kasan, 29.97, S., cloudy; Krotkowo, 30.23, S., cloudy. 17th, depression still about stationary and slowly filling up; pressure rapidly increasing over western Russia. Ekaterinburg, 30.39, calm; Krotkowo, 30.27, S., cloudy; Kasan, 30.13, S., snow; Archangel, 29.74, ESE., cloudy; St. Petersburg, 29.74, SW., fair; Dorpat, 29.76, SE., light snow; Moscow, 29.92, S., cloudy. By morning of the 18th, the depression had entirely filled up over northern Russia, the isobar of 30.20 replacing that of 29.80 on the previous day. No. XV.—This depression appeared suddenly off the northwestern coast of Norway on the morning of the 19th. Tromso, 29.48, a fall of 0.50 inch, NE., cloudy; Haparanda, 29.88, a fall of 0.18 inch, SE., snow; Brono, 29.71, a fall of 0.44 inch, SW. 27 miles per hour, cloudy. Over the southern portion of Scandinavia the barometer ranged from 30.15 to 30.35, with variable winds. During the day the depression moved southeastward, and by morning of the 20th was central over the Baltic. Wisby, 29.80, a fall of 0.31 inch, NNW., snow; Umea, 29.82, a fall of 0.18 inch, NE., cloudy; southerly winds with cloudy and partly cloudy weather and slowly falling barometer prevailed over northwestern Russia. Along the Norwegian coast the pressure ranged from 30.10 to 30.21, with northwesterly winds. During the day the depression passed slowly southeastward over the Baltic, and on the 21st disappeared under the influence of a high-pressure area in western Russia. No. XVII.—The approach of this depression off the northwestern coast of Norway closely resembled in its suddenness that of area No. XV. 21st, Tromso, 29.53, a fall of 0.44 inch, SW., cloudy; Brono, 29.85, a fall of 0.29 inch, SW., cloudy; Haparanda, 30.13, a rise of 0.23 inch, SE., cloudy; Archangel, 30.32, a rise of 0.18 inch, ESE., fair. 22d, depression central near the White Sea; Archangel, 29.92, a fall of 0.40 inch, ESE., cloudy; St. Petersburg, 30.02, a fall of 0.21 inch, NW., clear; Moscow, 29.85, a fall of 0.18 inch, E., cloudy; Kasan, 29.96, a fall of 0.30 inch. During the 23d, the depression disappeared over eastern Russia under the influence of a high-pressure area, 30.40. No. XVIII.—This depression first appeared north of Iceland on the 22d, as indicated by the barometer at Stykkisholm, which during the past twenty-four hours had fallen 0.63 inch, wind shifted from southeast to southwest. 23d, depression central off the northwestern coast of Norway. Stykkisholm, 30.10, a rise of 0.39 inch, W., force 6, cloudy; Tromso, 28.98, a fall of 0.99 inch, SW. 34 miles per hour, cloudy; Brono, 29.56, a fall of 0.65 inch, SW. 36 miles, cloudy; Haparanda, 29.68, a fall of 0.42 inch, S., fair; Umea, 29.80, a fall of 0.37 inch, SW., cloudy. 24th, depression central over Lapland, followed to the westward in Norway by winds shifting to northwesterly with rising barometer and snow; Haparanda, 29.40, NW., clear; Umea, 29.63, NW., clear; St. Petersburg, 29.55, a fall of 0.52 inch, SSE., light snow; Dorpat, 29.60, a fall of 0.56 inch, WSW., snow; Archangel, 29.57, a fall of 0.29 inch, SE., cloudy; Moscow, 30.09, a fall of 0.14 inch, S., fair. 25th, depression central in northern Russia; lowest barometer at Kasan, 29.65, a fall of 0.46 inch, W., clear; Krotkowo, 29.80, a fall of 0.29 inch, W., clear; Moscow, 29.96, a fall of 0.13 inch, S. fair; Archangel, 29.89, a rise of 0.32 inch, SE., cloudy; Ekaterinburg, 29.94, a fall of 0.34 inch, ENE., cloudy. 26th, depression disappeared in western Siberia under the influence of a high pressure area, 30.30. Concerning storms off the Asiatic coast, but one has been traced for the present month. There may have been others, and doubtless were, but insufficient data prevents the charting of any additional tracks. No. VI.—This depression first appeared south of the Island of Kinsin on the 2d; Nagasaki, 29.94, a fall of 0.12 inch, NNE., clear, 6.35 m.m. rainfall in past twenty-four hours; Hiroshima, 29.95, a fall of 0.08 inch, NNE., cloudy, 6.91 m.m. rainfall in past twenty-four hours; Wakayama, 29.83, a fall of 0.21 inch, raining, 14.91 m.m. rainfall in past twenty-four hours; Tokei, 29.95, a rise of 0.05 inch, N., raining, 17.78 m.m. rainfall in past twenty-four hours. 3d, depression central southeast of the Island of Nippon; Tokei, 29.68, NW., foggy; Wakayama, 29.87, NW., fair; Hiroshima, 29.91, WNW., clear; Nagasaki, 30.01, W., fair; in 32° 04′ N., 133° 30′ E., force 3 to 5, high NW. sea, hailing. 4th, depression disappeared to the eastward over the ocean; Tokei, 29.71, a rise of 0.03 inch, NW., clear; Wakayama, 29.94, a rise of 0.07 inch, W., raining; in 31° N., 130° 53′ E., WNW., force 4, high westerly sea, raining.

TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of December, 1881, is exhibited by lines of equal thermometric mean values upon Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. The mean temperature of the month is remarkably high, the thermometric values being everywhere above the normal, except in California. The region of greatest excess embraces the Upper Mississippi and Missouri Valleys, Minnesota, and the Lakes, the departures from the normal ranging from 9°.1 to 13°.1. The small area of deficiency for the present month occupies central California, with a departure from the normal of 1°.2. Southern California reports a normal condition. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1873, together with the corresponding districts: 1874, +5°.2 Lower Missouri Valley and —4°.7 St. Lawrence Valley; 1875, +10°.9 Lower Missouri Valley, +10°.2 Upper Mississippi Valley and +9°.0 Ohio Valley, Tennessee, and Minnesota; 1876, —8°.7 Upper Mississippi Valley and —8°.0 Ohio Valley and Tennessee; 1877, +20°.2 Minnesota and +17°.1 Upper Mississippi Valley; 1878, —4°.4 Lower Missouri Valley and —4°.2 Ohio Valley and Tennessee; 1879, —18°.5 Red River of the North Valley and —12°.4 Missouri Valley; 1880, —6°.9 Missouri Valley and —6°.0 Ohio Valley and Tennessee.

Deviations from mean temperatures.—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of Chart No. II. The following items of importance in connection with this subject are reported by voluntary observers: *Illinois:* Riley, mean temperature 9°.2 above the mean of the past nineteen years; higher mean temperatures occurred in 1875 and 1877. Mean temperature for the year 1881, 45°.6 or 0°.7 above the annual mean for the past eighteen years; the years 1863, 1870, 1877, and 1880 were warmer, while the mean of 1871 coincided with that of the present year; maximum temperature of the year, 97°, August 5; minimum —25°, January 14, giving a yearly range of 122°. *Kansas:* Lawrence, the following interesting summary is furnished by Prof. F. H. Snow of the State University: Mean temperature 11°.4 above the average of the past thirteen years; with the exception of December, 1877, December, 1881, was the warmest since 1868. Mean temperature for the year 1881, 54°.65 or 1°.31 above the annual mean of the past thirteen years; maximum temperature of the year, 104°, occurred on August 11 and 25; minimum, —8°, occurred on January 9, giving a yearly range of 112°. Mean temperature of the year at 7 a. m., 48°.87; 2 p. m., 63°.52; 9 p. m., 53°.12. Mean temperature of the winter months, 29°.16 or 0°.92 below the average of the past thirteen years; of the spring months, 53°.27 or 0°.74 above the average; of the summer months, 79°.41 or 3°.02 above the average, and of the autumn months, 56°.75 or 3°.86 above the average. The coldest month of the year was January, mean temperature 21°.60; the warmest month of the year was August, mean temperature 81°.23. The coldest week was from January 8 to 14, mean temperature 14°.45 warmest week was from July 5 to 11, mean temperature 85°.09. The coldest day was January 9, mean temperature —1°.5; warmest day was August 17, mean temperature 89°.7. The temperature fell below zero 6 times



and reached or exceeded 100° 14 times during the year. Yates Center, mean temperature 12°.3 above the average of the past two years. Wellington, mean temperature 38°.4 or 5°.8 above the mean of the past three years. *Maine:* Gardiner, mean temperature 31°.61 or 9°.31 above the mean of the past forty-five years; the warmest December previous to that of 1881 occurred in 1877, mean 29°.50; next warmest occurred 1847, mean 28°.65. During the past forty-five years there has been but three Decembers when the minimum temperature was above zero. *Maryland:* Fallston, mean temperature 39°.94 or 7°.38 above the average of the past ten years. Sandy Springs, mean temperature considerably above the average of the past fifteen years. *Michigan:* Thornville, mean temperature considerably above the average. *Missouri:* Saint Louis.—The following report is furnished by Mr. D. B. Kribben: mean temperature 41°.07 or 7°.87 above the normal. Mean temperature for the year, 56°.06 or 0°.66 above the normal. Maximum temperature for the year, 104°.9, occurred on August 12; minimum temperature, 9°.4 on January 14. Saint Louis, Missouri Weather Service reports mean temperature 41°.70 or 8°.50 above the average of the past forty-four years; the mean temperature of December, 1881, has been exceeded but twice in the past forty-four years, viz, in 1875, mean, 41°.9, and in 1877, mean 46°.7. *Montana:* Blackfeet Agency, mean temperature considerably above the average; month unusually mild. *New Hampshire:* Contoocookville, mean temperature, 33°.8, or nearly 10° above the average of the past ten years; in some parts of this portion of the State it is reported to be the warmest December for the past twenty-five years. *New Jersey:* Moorestown, mean temperature considerably above the average of the past eighteen years and not exceeded or even equaled by any December during that period. Freehold, mean temperature considerably above the average of the past seven years. *New York:* Waterburgh, mean temperature 34°.5, or 8°.1 above the mean of the past ten years; with the exception of December, 1881, that of 1877 was the warmest during that period. Ardenia, mean temperature considerably above the average; month unusually mild. North Volney, mean temperature 33°.7 or 8°.9 above the mean of the past thirteen years; with the exception of December, 1881, that of 1877 (mean 31°.63) was the warmest during that period; the coldest occurred in 1876, mean 18°.02. The mean temperature of the year at 7 a. m. was 42°.41; at 2 p. m., 53°.40, and at 9 p. m., 44°.54. Yearly range of temperature 112°. The average of the mean annual temperatures for the past twelve years is 45°.31; highest annual mean, 47°.74, occurred in 1878; lowest, 41°.61, occurred 1875. Palermo, mean temperature considerably above the average of the past twenty-eight years. Mean temperature of the year 44°.40 or 0°.60 below the mean of the past twenty years. Hector, mean temperature considerably above the average; month unusually warm and open. *Ohio:* Cleveland, mean temperature 38°.1 or 7°.36 above the mean of the past twenty-seven years; highest monthly mean during that period, 40°.51, occurred in 1877; lowest, 20°.99, occurred in 1876. *Pennsylvania:* New Castle, mean temperature 37°.9 or 7°.78 above the mean of the past sixteen years. Dyberry, mean temperature considerably above the average of the past twenty years, and warmer than any December during that period,

Table of maximum and minimum temperatures for December, 1881.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Mobile	75		Auburn		28
Do	Montgomery		33			
Arizona	Florence and Tuscon	82		Texas Hill	85	
Do	Fort Apache and Prescott.		13			
Arkansas	Little Rock	69	34	Mount Ida		22
California	Los Angeles	79		Indio and Poway	82	
Do	Campo		15	Summit		12
Colorado	Denver	67	18			
Do	Pike's Peak	27	—11			
Connecticut	New Haven	58	13	Southington	61	8
Do	New London	58				
Dakota	Smithville	64		Fort Buford		—25
Do	Fort Buford		—20			
Delaware	Delaware Breakwater.	69	22			
District of Columbia	Washington	70	21	Receiving Reservoir.	73	18
Florida	Key West			Fort Brook, Tampa	87	
Do	Punta Rassa		83	Fort Barrancas		25
Do	Pensacola		38			
Georgia	Savannah	77		Forsyth	78	
Do	Augusta		29			
Idaho	Boisé City	54				
Do	Eagle Rock		—10			
Illinois	Cairo	67		Elmira		4
Do	Champaign		12			

Table of maximum and minimum temperatures for December, 1881—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Indiana	Indianapolis	63	14	Laconia	65	
Do				Wabash		14
Indian Territory	Fort Gibson	73				
Do	Fort Supply		18			
Iowa	Keokuk	60		Nora Springs		—10
Do	Dubuque		8			
Kansas	Dodge City	72	17	Independence	73	
Do	Leavenworth		17	Topeka		8
Kentucky	Louisville	67	19	Bowling Green	66	21
Louisiana	New Orleans	77				
Do	Shreveport		31			
Maine.	Eastport	52	0	Cornish	60	
Do				Dexter		—3
Maryland	Baltimore	71	24	Fallston	74	
Do				Great Falls		14
Massachusetts	Thatcher's Island	67	9	Heath		1
Michigan	Detroit	59		Fort Brady	57	—6
Do	Escanaba		8			
Minnesota	Saint Paul	53		Fort Snelling	52	
Do	Saint Vincent		20			
Mississippi	Vicksburgh	75	33	Fayette	73	32
Missouri	Saint Louis	64	15	Sedalia and Pierce City.	70	
Do		67		Oregon and Saint Louis.		14
Montana	Fort Benton	67				
Do	New Chicago		16			
Nebraska	Omaha			Lincoln	60	
Do	North Platte	59	9	Genoa		6
Nevada	Pioche	65				
Do	Winnemucca		7	Golconda	75	
Do				Boca		—10
New Hampshire	Mount Washington	41	—21	Contoocookville	62	
Do				Grafton		—2
New Jersey	Sandy Hook	69		Atco	70	
Do	Atlantic City		19	Somerville		6
New Mexico	La Mesilla	80		Fort Stanton	70	—1
Do	Silver City		11			
New York	New York	66		Madison Barracks	54	—2
Do	Albany		11			
North Carolina	Wilmington	73		Weldon	74	
Do	Kittyhawk		26	Highlands		12
Ohio	Cincinnati	65		Portsmouth	73	
Do	Cleveland and Columbus.		17	Bellefontaine		13
Oregon	Portland	58		Fort Klamath	50	—1
Do	Umatilla		21			
Pennsylvania	Philadelphia	69		Blooming Grove		
Do	Pittsburgh		15	Franklin		10
Rhode Island	Newport	60	15	Fort Adams	56	14
South Carolina	Charleston	76	33	Aiken, Columbia, & Stateburg.		28
Tennessee	Memphis	70				
Do	Knoxville		23			
Texas	Edinburgh and Rio Grande.	83		Fort Brown	87	32
Do	El Paso and Fort Elliott.		18			
Utah	Salt Lake City	49	17	Blue Creek and Corinne.	50	
Do				Promontory		0
Vermont	Burlington	56	4	Woodstock	62	—1
Virginia	Cape Henry	74		Wytheville		12
Do	Lynchburgh		22			
Washington Territory	Dayton	60				
Do	Colfax and Spokane		10			
West Virginia	Morgantown	68	22	Helvetia	60	15
Wisconsin	La Crosse	54	1	Neillsville	56	—4
Wyoming	Cheyenne	58	11	Forts Bridger and Washakie.		—9

except December, 1877. Wellsborough, **mean temperature considerably above the average of the past twenty-five years.** *Vermont:* **Woodstock, mean temperature** 30°.1 **or** 10°.6 **above the mean of the** past fourteen years; lowest **December mean** occurred **in** 1872, **and highest in 1877.** Catawissa, **mean temperature considerably above the** average; **month very pleasant.** *Virginia:* Wytheville, **mean** temperature 39°.3 **or** 4°.5 above the **mean of the past** seventeen years. *West Virginia:* **Helvetia, mean temperature** 39°.2 **or** 6°.31 **above the mean of the past six years. Mean temperature for the year** 50°.71 **or** 0°.22 **below the mean of the past six years.**

Table of comparative minimum temperatures for the month of December.

State or Territory.	Minimum for December, 1881, Signal Service.		Lowest since Signal Service stations were opened—3 to 10 years.			Lowest from any other source.		
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Length of record.
		°		°			°	*Years.*
Alabama	Montgomery	33	Montgomery	8	1880	Huntsville	— 7	9
Arizona	Fort Apache and Prescott	13	Prescott	—18	1879	Fort Canby	—25	12
Arkansas	Little Rock	34	Little Rock	6	1880	Washington	— 6	28
California	Campo	15	Campo	7	1878	Fort Jones	—17	5
Colorado	Pike's Peak	—11	Pike's Peak	—37	1878	Fort Garland	—30	39
						Fort Lyon	—30	20
Connecticut	New London	13	New Haven	— 4	1880	Middletown	—18	10
						Fort Totten	—51	7
Dakota	Fort Buford	20	Pembina	—49	1876	Fort Stevenson	—54	7
			Forts Stevenson and Buford	—46	1879	Fort Sully	—30	16
Delaware	Delaware Breakwater	22	Delaware Breakwater	1	1880	Fort Delaware	9	44
						Dover	6	6
District of Columbia	Washington	21	Washington	—13	1880	Washington	—10	48
Florida	Pensacola	38	Pensacola	17	1880	Fort Barrancas	15	52
Georgia	Augusta	29	Atlanta	1	1880	Fort McPherson	6	11
Idaho	Eagle Rock	—10	Lewiston	—16	1879	Fort Hall	—30	10
Illinois	Champaign	12	Chicago	—15	1880	Rock Island Arsenal	—26	14
Indiana	Indianapolis	14	Indianapolis	—15	1876	Wabash	—19	6
Indian Territory	Fort Supply	18	Fort Gibson	— 9	1876	Fort Sill	—11	10
Iowa	Dubuque	8	Dubuque	—19	'76,'79, '80	Cresco	—28	8
Kansas	Dodge City and Leavenworth.	17	Dodge City	—15	1876	Fort Wallace	—24	8
						Fort Leavenworth	—21	50
Kentucky	Louisville	19	Louisville	— 7	1880	Newport Barracks	— 8	28
Louisiana	Shreveport	31	Shreveport	—10	1880	Okalooska.	10	3
						Fort Jessup	14	22
Maine	Eastport	0	Eastport.	—20	1875	Gardiner	—24	45
Maryland	Baltimore	24	Baltimore	— 3	1880	Emmittsburg	—19	7
Massachusetts	Boston	10	Boston	—11	1875	Billerica	—20	8
						New Bedford	—10	60
Michigan	Escanaba	8	Escanaba	—23	1880	Fort Brady	—41	58
Minnesota	Saint Vincent	—20	Saint Vincent	—42	1880	Fort Ripley	—40	14
Mississippi	Vicksburgh	33	Vicksburgh	12	1880	Fayette	11	8
Missouri	Saint Louis	15	Saint Louis	—15	1880	Rolla	—23	7
Montana	New Chicago	—16	Fort Benton	—59	1880	Camp Baker	—53	9
Nebraska	Omaha and North Platte	9	North Platte	—27	1879	Sidney Barracks	—37	5
						Glendale	—30	2
Nevada	Winnemucca	7	Winnemucca	—20	1879	Fort Halleck	—22	12

New Hampshire	**Mount Washington**	—21	**Mount Washington**	—47	1876	**Dartmouth College**	—29	18
New Jersey	**Atlantic City**	19	**Atlantic City and Barnegat**	— 7	1880	**Stratford**	—24	11
						Linden	—18	6
						Newark	—11	20
New Mexico	**Silver City**	11	**Santa Fé**	—13	1879	Fort Union	—28	30
New York	Albany	11	Albany	—17	1875	Madison Barracks	—44	54
						Gouverneur	—40	40
North Carolina	Kittyhawk	26	Charlotte	— 5	1880	Lenoir	—16	8
						Fort Johnson	9	54
Ohio	Cleveland and Columbus	17	Sandusky	—13	1880	Kenson	—20	3
						College Hill	—10	68
Oregon	Umatilla	21	Portland	3	1879	Eola	— 8	7
Pennsylvania	Pittsburgh	15	Erie	—11	1880	Lewisburgh	—23	6
						Fleming	—19	6
						Carlisle Barracks	—14	34
Rhode Island	Newport	16	Newport	— 3	1875	Providence	—12	36
South Carolina	Charleston	33	Charleston	13	1880	Aiken	3	7
						Charleston	20	104
Tennessee	Knoxville	23	Knoxville	— 5	1880	Clarksville	— 4	8
Texas	Fort Elliott	18	Fort Elliott	—10	1879	Camp Stockton	— 9	15
Utah	Salt Lake City	17	Salt Lake City	—10	1879	Fort Crittenden	—22	3
						Coalville	—22	16
Vermont	Burlington	4	Burlington	—19	1879	Lunenburgh	—36	20
Virginia	Lynchburgh	22	Fort Whipple	—11	1880	Dover	—34	2
						Fortress Monroe	17	56
Washington Territory	Spokane Falls and Colfax	10	Olympia	—17	1879	Fort Colville	—22	21
						Fort Townsend	—22	23
West Virginia	Morgantown	22	Morgantown	— 9	1880	Flemington	—21	1
Wisconsin	La Crosse	1	La Crosse	—26	1879	Fort Howard	—38	32
Wyoming	Cheyenne	11	Cheyenne	—24	'79, '80	Fort Fetterman	—36	14

Ranges of temperature at Signal Service stations.—Monthly ranges in general varied from 40° to 55° over the country east of the Rocky Mountains, and from 35° to 50° westward to the Pacific. The smallest ranges are: San Francisco, 20°; Key West, 22°; Lewiston, Idaho, 23°; Grand Haven, 28°; Portland, Oreg., 29°; Sacramento, 30°; Port Eads and Galveston, 31°; Salt Lake City, 32°. The largest are: New Chicago, Mont., 76°; Fort Buford, 71; Fort Benton, 70°; Bismarck, 68°; Fort Stevenson, 64°; Smithville, Dak., 63°; Mount Washington, 61°. The daily ranges varied in the different districts as follows: New England, 24° at Wood's Holl to 34° at Eastport and 35° on summit of Mount Washington; Middle Atlantic States, 21° at Cape May to 31° at Albany and 35° at Philadelphia; South Atlantic States, 21° at Jacksonville and Charleston to 31° at Augusta, Smithville, Wilmington, and Portsmouth; Florida Peninsula, 16° at Key West to 18° at Cedar Keys and Punta Rassa; East Gulf States, 20° at New Orleans to 29° at Vicksburgh; West Gulf States, 17° at Port Eads to 28° at Fort Gibson and 37° at Mason; Rio Grande Valley, 28° at Brownsville to 37° at Castroville and 45° at Uvalde; Ohio Valley and Tennessee, 19° at Champaign, to 29° at Knoxville and 30° at Nashville and Pittsburgh; Lower Lake region, 25° at Toledo to 29° at Erie and Rochester; Upper Lake region, 16° at Grand Haven to 26° at Alpena and 33° at Duluth; Upper Mississippi Valley, 22° at Madison to 28° at Keokuk and 33° at Saint Paul; Missouri Valley, 26° at Omaha to 38° at Huron and 39° at Saint Vincent; Extreme Northwest, 32° at Moorhead to 40° at Bismarck and Fort Buford; Southern Slope, 28° at Henrietta to 40° at Concho and 43° at El Paso and Stockton; Middle Slope, 21° at Pike's Peak to 36° at Denver and 39° at Fort Elliott; Northern Slope, 36° at Fort Keogh to 41° at Cheyenne and 43° at North Platte; Southern Plateau, 41° at Silver City and Fort Verde to 49° at La Mesilla; Middle Plateau, 18° at Salt Lake City to 30° at Winnemucca and 36° at Pioche; Northern Plateau, 17° at Lewiston to 29° at Umatilla and 34° at Eagle Rock; South Pacific Coast region, 30° at San Diego to 35° at Visalia and 52° at Campo; Middle Pacific Coast region, 10° at San Francisco to 21° at Sacramento and 30° at Red Bluff; North Pacific Coast region, 14° at Olympia to 17° at Portland.

Frosts.—In the various districts they were reported on the following dates: New England, 2d, 3d, 5th to 12th, 14th to 25th, 28th, 31st; Middle Atlantic States, 2d, 3d, 5th, 6th, 8th to 12th, 15th to 21st, 23d to 26th, 30th, 31st; South Atlantic States, 6th to 13th, 15th to 20th, 24th, 25th, 30th, 31st; East Gulf States, 6th, 15th to 18th, 22d to 24th, 27th, 30th, 31st; West Gulf States, 1st, 15th, 16th, 17th, 21st, 22d, 24th, 26th, 29th, 30th, 31st; Rio Grande Valley, 15th, 16th, 17th, 21st, 22d, 25th, 26th, 28th, 30th, 31st; Ohio Valley and Tennessee, 1st, 2d, 4th to 11th, 14th to 20th, 22d to 26th, 29th to 31st; Lower Lake region, 1st to 12th, 14th to 21st, 23d, 24th, 25th, 30th, 31st; Upper Lake region, 1st to 31st; Extreme Northwest, 1st to 31st; Upper Mississippi Valley, 1st to 20th, 22d to 31st; Missouri Valley, 1st, 2d, 4th to 18th, 21st to 31st; Northern Slope, 1st to 31st; Middle Slope, 1st to 5th, 7th to 11th, 13th to 15th, 18th to 20th, 22d to 31st; Southern Slope, 1st, 5th, 14th, 15th, 16th, 20th to 23d, 25th, 26th, 27th, 29th, 30th; Southern Plateau, 1st to 31st; Middle Plateau, 1st to 31st; Northern Plateau, 1st to 31st; North Pacific Coast region, 1st to 5th, 8th to 14th, 16th, 17th, 19th, 20th, 21st, 23d, 24th, 25th, 27th, 28th; Middle Pacific Coast region, 2d, 3d, 5th, 11th, 13th, 14th, 16th to 23d, 25th, 29th, 30th, 31st; South Pacific Coast region, 3d, 8th to 11th, 13th, 14th, 16th to 26th, 30th, 31st.

Ice.—Regarding its formation in northern sections, this subject is considered elsewhere in the Review under the head of *Ice in Rivers and Harbors*. The following are exceptional cases of ice formation in the southern portions of the country: Visalia, Cal., 20th; Fayette, Miss., 16th, 30th; Clarksville, Tex., ice formed but once during month; Fort McKavett, Concho, and Stockton, Tex., 15th; Denison, Tex., 21st; Brackettville, 31st; Memphis, 5th, 16th; Cape Lookout, N. C., 31st, ponds frozen.

PRECIPITATION.

The general distribution of rainfall for the month of December, 1881, is exhibited upon Chart No. III from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records of Signal Service stations covering a period of several years, to which is subjoined a comparison of the present month with such averages. Upon comparison with the chart, the tabulated averages show a general deficiency of rainfall throughout the country west of the Mississippi, with the largest departures in the Pacific Coast States. Throughout the area of deficiency the departures range from 0.06 inch in the Southern Rocky Mountain Slope to 1.83 inches in the South Pacific Coast region. A second area of deficiency, but comparatively small, embraces the South Atlantic States and Florida Peninsula, with departures ranging from 0.4 inch in the latter to 0.99 inch in the former. Throughout the remainder of the United States the rainfall is above the normal, the departures of excess ranging from 0.10 in the Upper Lake region to 3.12 inches in the

Eastern Gulf States. As a means of interesting comparison, the following maximum departures from the average precipitation are given for each year since 1872, together with the corresponding districts: 1873, large excess, Ohio Valley, Tennessee and the Lower Lake region; 1874, +2.00 inches, Western Gulf States; 1875, +2.65 inches, Western Gulf States, and +5.64 inches in the North Pacific Coast region; 1876, 3.00 inches, Eastern Gulf States, and —4.00 inches in the Pacific Coast regions; 1877, —2.02 inches, New England, and +2.05 inches in the Eastern Gulf States; 1878, +3.20 inches, Saint Lawrence Valley, and —3.65 inches in the North Pacific Coast region; 1879, +2.61 inches, Ohio Valley, and +4.84 inches in Tennessee; 1880, +5.02 inches, North Pacific Coast region, and +7.25 inches in the Middle Pacific Coast region.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from regular Signal Service stations are shown in the table of comparative monthly rainfalls, as published in the lower left-hand corner of Chart No. III. The following items of importance in connection with this subject are reported by Voluntary Observers: *Illinois:* Riley, monthly rainfall, 0.80 inch above the average of the past twenty years; larger rainfalls were reported in 1863, 1866, 1873, and 1877. Annual rainfall 47.22 inches, or 13.83 inches above the average of the past twenty years and 1.41 inches above the maximum annual rainfall for that period which occurred in 1868. Of the 47.22 inches of precipitation for 1881, 11.42 inches were melted snow; rain fell on ninety-three days and snow on forty-three days. *Kansas:* Lawrence, the following interesting record is furnished by Prof. F. H. Snow, of the State University: Monthly rainfall 0.90 inch, or 0.84 inch below the average of the past thirteen years. Annual rainfall for the year 1881, 33.27 inches or 1.56 inches below the average of the past thirteen years. Either rain or snow, or both, fell on one hundred and ten days, or 7 more than the average. The entire snowfall for the year was 32.50 inches or 12.06 inches above the average of the past thirteen years. Yates Center, monthly rainfall, 0.71 inch above that of 1880, and 0.50 inch below the average of 1879 and 1880. Wellington, monthly rainfall, 0.67 inch, or about the December average of the past three years. *Maine:* Gardiner, monthly rainfall, 6.56 inches or 2.88 inches above the average of the past forty-five years; this amount has been exceeded but once, viz, in 1878, when the December rainfall measured 7.55 inches. *Maryland:* Sandy Springs, monthly rainfall, 6.01 inches; considerably above the average of the past fifteen years. *Missouri:* Saint Louis, the following report is furnished by Mr. B. D. Kribben: monthly rainfall, 1.56 inches or 1.41 inches below the normal. Rainfall for the year, 32.22 inches or 4.09 inches below the normal. Saint Louis, Missouri Weather Service reports, monthly rainfall 1.50 inches or 1.47 inches below the average of the past forty-four years. *New Hampshire:* Contoocookville, monthly rainfall, 5.80 inches, or more than double the average of the past ten years; only about one-fourth of the average amount of snow fell. *New Jersey:* Lambertville, monthly rainfall considerably below the average; rainfall for the year, 32.78 inches or 9.20 inches below the average of the past five years. *New York:* Waterburg, monthly rainfall, 5.04, or 2.31 inches above the average of the past nine years. Ardenia, monthly rainfall considerably above the average. North Volney, monthly rainfall, 5.80 inches or 2.64 inches above the average of the past nine years; largest monthly rainfall during that period, 8.35 inches, fell in 1878; smallest, 1.80 inches, fell in 1875. Rainfall for the year, 33.27 inches, or 4.62 inches below the average of the past eight years; the largest annual amount, 48.35 inches, fell in 1878, and the smallest, 31.20 inches, fell in 1875. During the year 1881, rain or snow fell on one hundred and eighty-nine days. Palermo, monthly rainfall considerably below the average; rainfall for the year, 29.60 inches or 5.60 inches below the average of the past ten years; snowfall for the year, 60.50. *Virginia:* Wytheville, monthly rainfall, 4.15 inches or 1.15 inches above the average of the past seventeen years. *West Virginia:* Helvetia, monthly rainfall, 8.81 inches or 3.94 inches above the average of the past six years. Rainfall for the year, 56.53 inches or 2.63 inches above the average of the past six years.

Special heavy rains.—4th, Red Bluff, Cal., 2.89 inches. 13th, Champaign, Ill., 3.21; Springfield, Ill., 3.33. 14th, Mount Washington, 3.03; Montgomery, Ala., 2.93. 20th and 21st, Fort Barrancas, Fla., 5.23. 21st, Pensacola, Fla., 2.95; Montgomery, Ala., 3.45; Chattanooga, 2.88; Fort Eads, La., 3.79. 22d, Highlands, N. C., 2.52. 25th, Port Eads, La., 3.83. 26th, Highlands, N. C., 3.95.

Largest monthly rainfalls, including melted snow.—Mount Washington, 15.95 inches: Highlands, N. C., 14.29; Alta, Cal., 13.60; Fort Stevens, Oreg., 13.47; Fort Canby, Wash, 11.55; Port Eads, La., 11.28; Pensacola, Fla., 10.76; Montgomery, 9.75; Wellsborough, Pa., 9.57; Fort Gaston, Cal, 9.24; Mobile, 9.15; Summit, Cal., 9.05; Victoria, B. C., 8.98; Olympia, 8.86; Chattanooga, 8.83; Helvetia, W. Va., 8.81; Cisco, Cal., 8.76; Champaign, Ill., 8.54; Berryville, Cal., 8.25; Colfax, Cal., 8.01; Bainbridge Island, Wash., 8.00; Paterson, N. J., 7.87; Atlanta, 7.53; Halifax, N. S., 7.24; College Hill, Ohio, 7.00; Thatcher's Island, Mass., Northport, Mich., Great Falls, Md., and Orono, Me., 6.88; Forsyth, Ga., 6.85; Albany, Oreg., and Oswego, N. Y., 6.78; Johnstown, N. Y., 6.71; Woodstock, N. H., 6.65; Portland, Oreg., 6.64; New Orleans, 6.62; Antrim, N. H., 6.60; Niles, Mich., 6.59; Gardiner, Me., 6.56; Murphy, N. C., 6.55; Erie, 6.44; South Lee, Mass., 6.41; Dexter, Me., 6.40; Flemington, W. Va., 6.33; Auburn, Ala., and Ashland, N. H., 6.30; Kittyhawk, N. C., 6.29; Sandusky, 6.27; Eastport, 6.25; Lynchburg, Va., and Grafton, N. H., 6.22; Amherst, Mass., 6.15; Washington, D. C., 6.12; Bristol, N. H., 6.08; Redding, Cal., 6.07; Rising Sun, Ind., 6.05; Worcester, Mass., 6.04; Cooperstown, N. Y., 6.02; Sandy Springs, Md., 6.01; Louisville, 6.00.

Smallest monthly rainfalls, including melted snow.—Colton, Indio, Kingsburgh, Lemoore, Mammoth Tank, Tuhey's Ranche, and White Water, Cal., Fort Hale and Rapid City, Dak., Casa Granda, Maricopa, Pantano, and Wilcox, Ariz., and Fort Gibson and Denver, none; Delano and Mojave, Cal., Fort Totten, and Fort Lincoln, Dak., and Deming, N. Mex., trace; Cheyenne, and Fort Washakie, Wyo., and Fort Wallace, Kans., 0.01 inch; Deadwood, Dak., 0.02; San Simon, Ariz., and Fort Shaw, Mont., 0.04; Tulare, Cal., and Bismarck and Huron, Dak., 0.06; Fort Benton, Mont., 0.07; Fort Assinniboine, Mont., and Pioche, Nev., 0.08; Fort Buford, Dak., 0.09; Yuma, Ariz., Fort Garland, Cal., Fort Randall, Dak., Fort Keogh, Mont., Tecoma, Nev., and Fort Union, N. Mex., 0.10; Yankton, 0.11; Tehachapi, Cal., 0.12; North Platte, 0.13; Florence, Ariz., 0.14; Morriston and Olivet, Dak., and Fort Snelling, Minn., 0.15; Fresno and Sumner, Cal., 0.16; Fort Stevenson, Dak., and Texas Hill, Ariz., 0.18; Goshen and Ravenna, Cal., and Tucson, Ariz., 0.19; Moorhead and Duluth, Minn., and Newhall, Cal., 0.20; Fort Custer, Mont., 0.22; Fort Supply, Ind. T., 0.23; Campo, Cal., 0 24; Saint Vincent, Minn., and Corinne and Ogden, Utah, 0.25; La Crosse, Wis., and Fort Elliott, Tex., 0.26; Visalia, Cal., 0.27; Silver City, N. Mex., 0.28; Camp near Presidio, Tex., 0.29; San Diego and Keene, Cal., 0.30; Fort McDermott, Nev., and Borden and San Fernando, Cal., 0.32; Prescott, Ariz., 0.33; Rock Creek, Mont., and Fort Apache, Ariz., 0.34; Forts Wingate and Stanton, N. Mex., and Minneapolis, Minn., 0.35; Fort Bridger, Wyo., 0.36; Anaheim, Cal., 0.37; Helena, Mont., 0.38; Camp Thomas, Ariz., Pagosa Springs, Cal., Topeka, Kan., Beowawe and Toang, Nev., and Blue Creek and Promontory, Utah, 0.40; San Gorgonio, Cal., 0.42; Northfield, Minn., Umatilla, Oreg., Browns, Nev., and Terrace, Utah, 0.45; Golconda, Nev., 0.47; Genoa, Nebr., Fort Lewis, Colo., and Pembina, Dak., 0.50.

Rainy days.—The number varied in New England from 12 to 26; Middle Atlantic States, 10 to 18; South Atlantic States, 8 to 17; Florida Peninsula, 7 to 11; East Gulf States, 11 to 17; West Gulf States, 6 to 17; Rio Grande Valley, 4 to 11; Ohio Valley and Tennessee, 9 to 18; Lower Lake region, 17 to 24; Upper Lake region, 6 to 21; Extreme Northwest, 3 to 10; Upper Mississippi Valley, 9 to 14; Missouri Valley, 4 to 10; Northern Slope, 2 to 10; Middle Slope, 0 to 9; Southern Slope, 3 to 5; Southern Plateau, 2 to 4; Middle Plateau, 2 to 9; Northern Plateau, 3 to 16; North Pacific Coast region, 22 to 26; Middle Pacific Coast region, 12 to 14; South Pacific Coast region, 2 to 6.

Cloudy days.—The number varied in New England from 8 to 21; Middle Atlantic States, 7 to 15; South Atlantic States, 6 to 13; Florida Peninsula, 4 to 7; East Gulf States, 8 to 15; West Gulf States, 6 to 17; Rio Grande Valley, 7 to 14; Ohio Valley and Tennessee, 13 to 18; Lower Lake region, 17 to 19; Upper Lake region, 8 to 20; Extreme Northwest, 1 to 5; Upper Mississippi Valley, 4 to 12; Missouri Valley, 4 to 11; Northern Slope, 3 to 9; Middle Slope, 0 to 8; Southern Slope, 1 to 11; Southern Plateau, 2 to 4; Middle Plateau, 7 to 10; Northern Plateau, 4 to 16; North Pacific Coast region, 16 to 31; Middle Pacific Coast region, 6 to 10; South Pacific Coast region, 2 to 9.

Largest monthly snowfalls.—Mount Washington, 48.90 inches; Summit, Cal., 43.00; Cisco, Cal., 34.00; Berryvale, Cal., 26.50; Truckee, Nev., 20.50; Boston, 19.20; Emigrant Gap, Cal., 17.00; South Lee, Mass., 15.50; Alta, Cal., 15.00; Humboldt and Winnemucca, Nev., 12.00; Boca and Palisade, Nev., and Logan, Iowa, 10.00; Otega, Nev., 9.75; Kelton, Utah, and White Plains, N. Y., 9.00; Fort Missoula, Mont., 8.80; Wells, Nev., 8.50; Alpena, Mich., 8.10; Lunenburgh, Vt., and Eagle Rock, Idaho, 8.00; Marquette, Mich., 7.60; Highland, N. C., 7.50; De Soto, Nebr., and Carson City, Nev., 6.50; Escanaba and Grand Haven, 6.40; Omaha, 6.30; Halleck, Nev., Dexter, Me., North Volney, N. Y., and Independence, Iowa, 6.00.

Snow.—The dates on which snow fell in the various districts are as follows; New England, 1st to 5th, 7th to 16th, 18th to 25th, 27th, 29th, 30th, 31st; Middle Atlantic States, 3d to 5th, 10th to 12th, 14th, 15th, 23d, 24th, 28th, 30th, 31st; South Atlantic States, 15th, 16th, 23d, 29th, 30th, 31st; East Gulf States, New Orleans, 25th, only a few flakes; Auburn, Ala., 29th, slight fall; Ohio Valley and Tennessee, 7th, 10th, 11th, 15th, 23d, 29th, 30th, 31st; Lower Lake region, 3d to 8th, 10th, 11th, 14th, 15th, 23d, 29th, 30th, 31st; Upper Lake region, 1st to 15th, 20th, 26th to 31st; Extreme Northwest, 1st, 2d, 8th, 9th, 12th, 13th, 19th, 20th, 28th to 31st; Upper Mississippi Valley, 1st to 3d, 7th, 8th, 10th to 13th, 21st, 27th to 31st; Missouri Valley, 10th, 19th to 22d, 29th to 31st; Northern Slope, 1st, 2d, 6th to 12th, 14th, 15th, 17th, 18th, 25th, 24th to 28th; Middle Slope, 1st, 2d, 10th, 19th, 20th, 21st, 25th to 28th; Southern Plateau, 16th to 20th;

Middle Plateau, 1st, 2d, 3d, 6th, 9th to 12th, 25th to 29th; Northern Plateau, 1st, 2d, 4th, 5th, 8th, 10th to 13th, 15th, 16th, 18th, 19th, 24th to 27th, 29th; North Pacific Coast region, 1st, 2d, 3d, 6th to 10th, 12th, 13th, 14th, 16th, 19th, 20th, 21st, 23d, 25th, 26th, 27th. The following is a report of unusually heavy snow: Spokane Falls, Wash., 24th. The Northern Pacific Railroad Company were obliged to use snow plows on the Spokane division, the snow being from two to three feet deep in that section.

Depth of snow on ground at end of month.—Colorado: Pike's Peak, trace. *Dakota:* Bismarck, 2 inches. *Illinois:* Cairo, 1 inch; Chicago, trace; Charleston, ½ inch; Morrison, ½ inch; Anna, 2½ inches; Riley, trace. *Indiana:* Laconia, ½ inch; Wabash, Logansport, and Vevay, 1 inch; Saint Meinrad, ¼ inch; Indianapolis, trace. *Iowa:* Dana, 1 inch; Fort Madison, 2 inches; Davenport, trace; Des Moines, ¼ inch. *Kentucky:* Bowling Green, 1½ inches. *Maine:* Eastport, trace. *Maryland:* Woodstock, trace. *Massachusetts:* New Bedford, ½ inch. *Michigan:* Marquette, 6 inches: Grand Haven, 5 inches; Escanaba, 2 inches; Detroit, 1½ inches; Alpena, ½ inch; Port Huron, trace; Battle Creek, 2 inches; Litchfield, 1 inch; Kalamazoo, 3 inches. *Minnesota:* Moorhead, trace; Saint Vincent, 10 inches; Saint Paul, less than 1 inch; Duluth, ½ inch. *Missouri:* Saint Louis, 1 inch. *Nebraska:* De Soto, ¼ inch. *New Hampshire:* Mount Washington, 7 inches. *New York:* Pen Yan, 3 inches; Waterburgh, Ithaca and Palermo, 2 inches; Cooperstown, 1½ inches; North Volney, 2½ inches; Friendship, 1 inch; White Plains, trace; Buffalo, 4 inches; Rochester, 2 inches; Oswego, 3 inches. *North Carolina:* Highlands, 5 inches; Charlotte, 4 inches. *Ohio:* North Lewisburgh, New Athens, Bethel, and Jacksonburgh, 2 inches; Bellefontaine and Ruggles, 1 inch; Toledo and Sandusky, ½ inch; Cleveland, 1 inch; Columbus, 1 inch; Cincinnati, ¼ inch. *Pennsylvania:* Dyberry and New Castle, 1 inch; Meadville, 1½ inches; Catawissa, ⅓ inch; Wellsborough, trace; Erie, 10 inches. *Rhode Island:* Newport, trace. *Tennessee:* Ashwood, 2 inches; Chattanooga, ¼ inch. *Vermont:* Burlington, ½ inch. *Virginia:* Wytheville, ½ inch. *Washington Territory:* Spokane Falls, 5 inches. *West Virginia:* Flemington, 1 inch; Morgantown, ¼ inch. *Wisconsin:* Beloit and Embarrass, ½ inch.

Hail.—Dubuque, 20th, from 7.03 to 7.08 p. m. Bangor, Me., 18th, a slight hail-storm between 10 and 11 a. m. North Volney, N. Y., 12th. Greensborough, N. C., 29th. Wytheville, Va., 1st, 29th. Albany, 8th.

Rain, hail, or snow from a cloudless sky.—Wellington, Kans., 7th, shower of spongy hail, lasting three minutes. Bainbridge Island, Wash., 18th, rain. Dyberry, Pa., snow, lasting 30 minutes.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 73 to 79; Middle Atlantic States, 67 to 80; South Atlantic States, 66 to 83; Florida Peninsula, 75 to 78; East Gulf States, 68 to 79; West Gulf States, 68 to 85; Rio Grande Valley, 72 to 85; Ohio Valley and Tennessee, 70 to 77; Lower Lake region, 66 to 80; Upper Lake region, 66 to 87; Extreme Northwest, 71 to 87; Upper Mississippi Valley, 65 to 79; Missouri Valley, 65 to 70; Northern Slope, 53 to 71; Middle Slope, 47 to 70; Southern Slope, 56 to 75; Southern Plateau, 50 to 63; Middle Plateau, 42 to 80; Northern Plateau, 73 to 86; North Pacific Coast region, 84 to 86; Middle Pacific Coast region, 84 to 86; South Pacific Coast region, 47 to 80. High stations report the following percentages not corrected for altitude: Cheyenne, 48.0; Pike's Peak, 66.4; Mount Washington, 84.4.

WINDS.

The prevailing winds during the month of December, 1881, at Signal Service stations, are shown on Chart No. II, by arrows, which fly with the wind. Throughout the Ohio Valley, Lake region, Upper Mississippi Valley, and New England, the winds are southerly; in the Middle Atlantic States, westerly; in the South Atlantic and Eastern Gulf States, northeasterly; in the Western Gulf States and Texas, variable; in the Missouri Valley and Northwest, northwesterly; throughout the Northern Slope, Northern Plateau, and North Pacific Coast region, south to west; in California, northwesterly; elsewhere, variable.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 31,104 miles; Pike's Peak, 17,972; Fort Shaw, Mont., 13,651; Delaware Breakwater, 12,833; New Shoreham, R. I., 12,736; Kittyhawk, N. C., 12,595; Wood's Holl, Mass., 12,166; Thatcher's Island, Mass., 12,064; Hatteras, N. C., 12,035; Cape May, 12,018; Sandy Hook, N. J., 10,791; Sandusky, 10,339; Fort Benton, Mont., 10,118; Portsmouth, N. C., 9,762; Fort Assinniboine, Mont., 9,661; Indianola, 9,621; Barnegat, N. J., 9,524; Macon, N. C., 9,376; Champaign, Ill., 9,321; Port Eads, 9,303; Cheyenne, 9,174; Buffalo, 9,172; Rochester, 9,126; Cape Henry, Va., 8,799; Grand Haven, 8,728; Milwaukee, 8,456; Saint Vincent, Minn., 8,405; Key West, 8,256; Atlanta, 8,158; Burlington, Vt., 8,069; Boston, 8,047. The smallest are: La Mesilla, N. Mex., 725; Fort Missoula, Mont., 1,359; Lynchburgh, Va., 1,365; Salt Lake City, 1,473; Visalia, Cal., 1,700; Red Bluff, Cal., 2,250; Memphis, 2,365; Silver City, N. Mex., 2,452; Boise City, 2,534; Springfield, Mass., 2,892; Florence, Ariz., 2,939; Rio Grande, Tex., 2,970.

High winds.—On the summit of Mount Washington the highest velocities recorded were: 170 miles, NW., 1st; 100, NW., 2d; 104, W., 14th; 126, SW., 22d. The dates other than those above mentioned, on which velocities exceeding 75 miles per hour occurred, are as follows: 6th to 10th, 12th, 13th, 15th, 17th, 18th, 20th, 24th to 26th, 29th, 30th. On Summit of Pike's Peak, maximum velocity, 76 miles, NW., occurred on the 29th; velocities of 50 miles or over were recorded as follows: on the 5th, 10th, 12th, 27th, 28th, 30th. Other high velocities were reported by the following stations: Fort Assinniboine, Mont., 50 miles, SW., 26th; Fort Benton, Mont., 52, NW., 7th; Fort Custer, Mont., 52, W., 11th; Port Eads, La., 52, E., 25th; Cape May, 52, N.W., 7th; Delaware Breakwater, 54, NW., 23d; Kittyhawk, N. C., 56, N., 15th.

Local storms.—Fremont, Ohio, 9th, several buildings wrecked; unusually high westerly winds during the day. Terrene, Miss., 13th, "heaviest storm ever known here occurred during the evening." Pensacola, Fla., 25th, heavy SE. gale; signs, etc., blown down; bark driven ashore outside of harbor. Macon, N. C., 27th, heavy SW. gale; fishing smack blown ashore.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for December, 1881, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 88.95 per cent. The percentages for the four elements are: Weather, 90.28; Direction of the wind, 89.42; Temperature, 88.66; Barometer, 87.29 per cent. By geographical districts they are: For New England, 91.8; Middle Atlantic States, 91.5; South Atlantic States, 91.6; Eastern Gulf States, 88.6; Western Gulf States, 85.4; Lower Lake region, 89.8; Upper Lake region, 88.6; Tennessee and the Ohio Valley, 88.4; Upper Mississippi Valley, 86.3; Lower Missouri Valley, 87.2; Northern Pacific Coast region, 92.5; Central Pacific Coast region, 89.2; Southern Pacific Coast region, 86.9. There were 70 omissions to predict (31 being due to the absence of reports from the Pacific coast) out of 3,813, or 1.83 per cent. Of the 3,743 predictions that have been made, 57, or 1.52 per cent. are considered to have entirely failed; 53, or 1.42 per cent. were one-fourth verified; 391, or 10.45 per cent. were one-half verified; 485, or 12.95 per cent. were three-fourths verified, 2,757, or 73.56 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—One hundred and thirty-nine Cautionary signals were displayed during the month of December, 1881, of which 125, or 89.92 per cent., were fully justified by winds of 25 miles per hour, or over, at or within a radius of 100 miles of the station. Ninety off-shore signals were displayed, of which 73, or 81.11 per cent., were fully justified; 86, or 95.55 per cent., were justified as to direction; 88, or 97.77 per cent., were justified as to velocity. Thirty-nine off-shore signals were changed from cautionary. Thirteen northwest signals were displayed, all of which were fully justified. Two hundred and forty-two signals of all kinds were displayed, of which 210, or 86.77 per cent., were fully justified. The above does not include signals ordered at 67 display stations, where the velocity is only estimated. One hundred and forty-seven winds of 25 miles or over were reported, for which no signals were ordered. Forty-four signals were ordered late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of December, 1881. In general the principal rivers of the country have remained at a moderate stage throughout the month. The formation and breaking up of ice has to a considerable extent interfered with the taking of river observations. At La Crosse the river was frozen over from the 10th to the 19th; Yankton, 1st to 27th, and Saint Paul, 9th to 14th. In the Mississippi the highest water occurred at Memphis on the 31st, when it reached within 4 feet 4 inches of the danger-line. The Missouri reached within from 11 to 17 feet of the danger-line at stations between Leavenworth and Yankton. The Ohio reached it highest water at Pittsburgh on the 28th, within 3 feet 2 inches of the danger-line. The Red, Cumberland, Tennessee, Monongahela, and Savannah Rivers reached their highest stage between the 23d and 31st, generally after the 27th, the water reaching within from 11 to 15 feet of the danger-line.

Ice in rivers and harbors.—*Missouri River:* Yankton, river frozen from 1st to 26th; open on 27th. Leavenworth, 30th, slush ice in river. *Lake Huron:* Alpena, 9th, 10th, 11th, 18th, 27th, floating ice; 15th, bay and river partly frozen over. *Connecticut River:*

Springfield, Mass., 12th, riven frozen. *Lake Superior:* Duluth, 31st, floating ice inside the breakwater. *Maumee River:* Toledo, 11th, floating ice. *Hudson River:* Albany-11th, river frozen; 12th, 13th, 16th, floating ice; 14th, 18th, river free from ice. *Rock River:* Rockford, Ill., 10th, floating ice; 11th, frozen over; 13th, clear of ice; 15th, floating ice; 19th, clear of ice; 30th, river frozen. *Muscatine River:* Muscatine, Iowa, 4th, clear of ice; 10th, floating ice; 13th, ferry-boats stopped running on account of ice. *Kennebec River:* Gardiner, Me., 11th, river closed; 14th, ice broke in river; 16th, river closed; 30th, river open. *Grand River:* Lansing, Mich., 10th, river closed; 13th, river open; 31st, river closed. *Mississippi River:* Dubuque, 10th, 30th, floating ice in river. Burlington, 30th, 31st, floating ice in river. Keokuk, 31st, floating ice in river. La Crosse, 10th, 31st, river frozen. Davenport, 19th, 30th, 31st, floating ice in river. Saint Paul, 9th, 31st, river frozen; 4th, 8th, 30th, floating ice; 15th, river frozen along the shores; floating ice in channel; 22d, river nearly clear of ice; 30th, gorge threatened in river. The following stations report an unusual absence of ice: Lawrence, Kans., river free from ice throughout the month; Northport, Mich., 31st, no ice in Lake Michigan or Traverse Bay; Clear Creek, Nebr., 31st, first December for eight years that Platte River did not freeze.

Closing of navigation.—Burlington, Iowa, 3d, all boats on the Upper Mississippi have gone into winter quarters; the last boat that touched this point was the White Eagle, bound for Saint Louis; river reported clear of ice from this station northward to Saint Paul. La Crosse, 31st, navigation closed. Cleveland, 15th, navigation virtually closed; nearly all vessels laid up and out of commission; all regular lines have suspended for the winter. Chicago, 30th, navigation generally closed; occasional "arrivals and clearings" are likely to continue as long as the weather permits. Albany, 8th, canal closed; navigation on river practically ended. Catawissa, Pa., 14th, navigation on north branch of canal closed.

Floods.—*Illinois:* Ottawa, 22d, very heavy and constant rains for the past three days; streams flooded and considerable damage done. *Virginia:* Petersburgh, 22d, all streams greatly swollen by heavy rains and several bridges washed away. Belfield, 23d, bridge over the Meherrin River washed away. *Tennessee:* Nashville, 25th, the lowlands in northern section of the city have been flooded during the past few days; no damage reported. *New York:* Albany, 23d, heavy freshet interfering with river navigation. 28th, heavy rains caused freshet in river, submerging docks and flooding cellars along Quay street, damage slight. Poughkeepsie, 23d, river unusually high.

Waterspouts.—Punta Rassa, Fla., 5th, 4.30 p. m., a large waterspout formed over the Gulf, apparently at a distance of about 8 miles from station. In appearance it resembled a long, crooked, leaden-colored pipe or hose, extending upward from a base of whirling spray to a mass of cumulo-stratus clouds. It remained nearly stationary, the trunk at times being bent and swayed about by the wind. The phenomenon was visible for about five minutes.

Drought.—Los Angeles, Cal., 24th, farmers apprehend drought; rainy season very backward and the usual water supply very low. Weldon, N. C., 31st, wells have not yet recovered from the effects of the late drought.

Low tides.—Life-saving Station No. 6, N. C., 31st, during almost the entire month the tide in the sound has been so low that navigation was seriously affected; this unusual state of the tide was probably due to numerous northerly gales.

High tides.—New Westminster, B. C., 23d, very high, flats flooded. Port Eads, La., 19th.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of Chart No. III. Observations made at Chincoteague and Portland, Me., came too late for publication.

ATMOSPHERIC ELECTRICITY.

Auroras.—The auroral displays during the month of December, 1881, were quite numerous, but none of them are characterized as unusually brilliant. The display of the 18th at Augusta, Ga., is perhaps the most remarkable, owing to its extreme southern latitude. The observer at that station reports the first appearance of the aurora as occurring at 7 p. m. in the northwest horizon; color, faint rose of a diffuse light, with an altitude of 15° and an azimuth of 40°; disappeared at 7.10 p. m. At 10.41 p. m. it reappeared, lasting about fifteen minutes, but the color had apparently changed to a pale yellow. The following are general displays of considerable extent: The display of the 8th was witnessed from Eastport, Me., westward to Fort Buford, Dak., the following intervening stations reporting: Eastport, 6.30 to 9 p. m.; Cornish, Me., 6 to 8 p. m.;

Gardiner, Me., 6.30 to 9 p. m.; Orono, Me., 7 p. m.; Dexter, Me., 6.30 to 8 p. m.; Newport, Vt., 7 p. m.; Williamstown, Mass., 7 to 9 p. m.; Fall River, Mass., 7 p. m.; New Corydon, Ind., during the night with streamers reaching an altitude of 20°; Marquette, 6.30 to 7 p. m.; Franklin, Wis., 7 p. m.; Duluth, 6.30 to 7.45 p. m.; Northfield, Minn., 7 p. m.; Morrison, Ill., 7 p. m.; Saint Vincent, Minn., 6.30 to 7.30 p. m.; Fort Buford, Dak., 10.30 p. m. The display of the 9th and 10th was probably a continuation of the 8th, as at several stations it was observed throughout the night. Portland, Me., 10th, 7 to 9 p. m.; Cornish, Me., 10th, 7 p. m.; Gardiner, Me., 10th, 7 to 9 p. m.; Harvard College, Cambridge, Mass., 10th, 6 p. m.; Williamstown, Mass., 10th, 9 p. m.; Fall River, 10th, 7 p. m.; Newport, Vt., 10th, 7 p. m.; Woodstock, Vt., 10th, 7 p. m.; Southington, Conn., 9th, 8 p. m., with streamers; New Corydon, Ind., 9th, during the night; Lansing, Mich., 10th, 7 p. m.; Fort Stevenson, Dak., 10th, 7.30 to 10.30 p. m.; Bismarck, 9th, 8 p. m. The most general display of the month was that of the 23d, the line of observation reaching from New Brunswick westward to Idaho; the following intervening stations reporting: Gardiner, Me., visible about midnight; Mount Washington, 7.22 to 11 p. m.; Williamstown, Mass., 9 p. m.; Southington, Conn., 10.30 p. m.; Ardenia, N. Y., 8 p. m.; Waterburgh, N. Y., 9 p. m.; Wellsborough, Pa., 8.30 p. m.; Washington, D. C., 8.15 to 9 p. m.; Rochester, 6.45 to 11.55 p. m.; Buffalo, 7 to 10 p. m.; Erie, 6.50 to 7.20 p. m.; Jacksonburgh, Ohio, 7 p. m.; Bellefontaine, Ohio, 6.30 to 7.40 p. m.; North Lewisburgh, Ohio, 8 p. m.; Ruggles, Ohio, 8 to 9 p. m.; Lansing, Mich., 7 p. m.; Litchfield, Mich., 8 p. m.; Thornville, Mich., 7 p. m.; Detroit, 10 p. m., to morning of 24th; Alpena, 5.30 p. m., to morning of 24th; Grand Haven, 7 to 10 p. m.; Escanaba, 6 to 11 p. m.; Marquette, 6.35 to 10.30 p. m.; Northfield, Minn., 8 p. m.; Duluth, 6.30 to 9.30 p. m.; Beloit, Wis., 7.30 p. m.; Manitowoc, Wis., 8 p. m.; Franklin, Wis., 8 p. m., very brilliant; Saint Paul, 8 p. m.; Riley, Ill., 7 to 10.30 p. m.; Cresco, Iowa, 7 to 9 p. m.; Fort Madison, Iowa, 7.30 p. m.; Guttenburgh, Iowa, 7 to 9 p. m.; Monticello, Iowa, 8 p. m.; Muscatine, Iowa, 9 p. m.; Dana, Iowa, 8.30 p. m.; Clear Creek, Nebr., 8.30; Morriston, Dak., 7 p. m.; Saint Vincent, Minn., 6 p. m. to midnight; Fort Bennett, Dak., 8.30 p. m.; Bismarck, 6 p. m. to morning of 24th; Fort Stevenson, Dak., 8 p. m. to morning of 24th; Fort Assinniboine, Mont., 6 p. m. to morning of 24th. Throughout the Northwest this display appeared to commence on the 20th and 21st, as follows: Fort Assiniboine, Mont., 20th, 9 p. m. to morning of 21st; 22d, 7 p. m. to morning of 23d; Fort Stevenson, Dak., 22d, 9 p. m. to morning of 23d; Saint Vincent, Minn., 7 p. m. to morning of 23d. The display of the 24th and 25th was probably a continuation of the 23d. Eastport, 24th, 7.40 p. m. to midnight; Gardiner, Me., 24th, 8 to 10 p. m.; Harvard College, Cambridge. Mass., 25th, 10.30 p. m.; Dyberry, Pa., 24th, 9 p. m.: Oswego, 24th, 10.45 to 11.50 p. m.; Rochester, 9 to 11.45 p. m.; Buffalo, 10.45 to 11.10 p. m.; Grand Haven, 24th, 8 p. m. to morning of 25th; Alpena, 24th, 7.30 to 11.15 p. m.; Northport, Mich., 24th, 10.25 p. m.: Escanaba, 24th, 8 to 11.30 p. m.; Marquette, 24th, 10.30 to 11.30 p. m.: Cresco, Iowa, 24th, 10 p. m.; Monticello, Iowa. 24th, 10.30 p. m.; Northfield, Minn., 24th, 10 p. m.; Fort Snelling. Minn., 25th, 8 p, m.; Saint Vincent, Minn., 25th, 8 to 10.30 p. m.: Olivet. Dak., 24th, 10 p. m.; Fort Stevenson, Dak., 6 to 8 p. m.; Fort Sully, Dak., 25th, about 9 p. m.; Fort Assinniboine, Mont., 24th, 6 p. m. to morning of the 25th; Helena, Mont., 24th, 8 p. m. The following were local displays: Eastport, 11th, 11 p. m. to midnight: Harvard College, Cambridge, Mass., 5th, 10 to 11 p. m.: New Corydon, Ind., 7th, visible for a short time after sunset; Fort Wayne, Ind., 20th, 9 p. m.: Port Huron, 4th, 9 to 10.12 p. m.; Clear Creek, Nebr., 17th, 8 p. m.; Duluth, 14th, 8 to 10.40 p. m.; Saint Vincent, 12th, 7 p. m. to midnight; Fort Stevenson, Dak., 11th, 10.30 p. m. to morning of 12th: Fort Assinniboine, Mont., 11th, 7 to 10.30 p. m.; 12th, 6 to 9.30 p. m.; Northfield, Minn., 14th, 9 p. m.

Thunder-storms.—They were reported in the various States and Territories as follows: Alabama, on the 13th, 14th, 28th; Arizona, 17th; Arkansas, 13th: Florida, 5th, 13th, 14th, 20th, 28th, 29th; Georgia, 4th, 29th; Illinois, 12th, 13th, 28th; Indiana, 1st, 12th, 13th, 14th, 19th; Indian Territory, 12th, 13th; Iowa, 1st, 7th, 12th, 13th, 20th, 27th; Kansas, 10th, 12th, 18th; Kentucky, 14th; Louisiana, 13th, 14th, 20th, 28th; Michigan, 12th, 20th; Mississippi, 3d, 13th, 14th, 28th; Missouri, 2d, 10th, 12th, 13th, 19th to 22d; North Carolina, 29th, 30th; Tennessee, 13th, 28th; Texas, 13th, 19th; Virginia, 22d, 29th.

Zodiacal light.—Saint Vincent, Minn., 13th; Springfield, Ill., 15th; Nashville, Tenn., 15th to 18th; Kitty Hawk, N. C., 17th; New Corydon, Ind., 8th, 9th, 10th, 15th to 19th, 23d, 24th, 25th, 28th; Monticello, Iowa, 31st; Cambridge, Mass., 6th, 10th, 11th, 15th, 16th, 18th, 19th, 21st; Somerset, Mass., 9th, 10th, 15th to 21st; Northport, Mich., 8th, 23d; Clear Creek, Nebr., 14th, 16th, 22d, 23d; Atco, N. J., 17th; Dyberry, Pa., 24th, Wytheville, Va., 17th.

Telegraphic communication interfered with by atmospheric electricity.—Brackettville, Tex., 19th.

OPTICAL PHENOMENA.

Lunar halos have been observed in the various districts on the following dates: New England, 1st to 4th, 6th, 8th, 9th, 11th, 13th, 31st; Middle Atlantic States, 1st to 6th, 8th, 9th, 10th, 25th, 26th, 28th, 29th, 31st; South Atlantic States, 1st, 3d, 4th, 6th, 7th, 24th, 26th, 28th, 31st; Florida Peninsula, 3d, 7th, 28th; East Gulf States, 1st, 6th, 24th, 31st; West Gulf States, 2d to 6th, 8th, 9th, 13th, 26th, 31st; Rio Grande Valley, 26th, 29th; Ohio Valley and Tennessee, 1st, 2d, 5th to 10th, 12th, 14th, 16th, 24th, 28th to 31st; Lower Lake region, 1st, 2d, 5th, 8th, 9th, 11th, 20th, 24th, 25th, 29th, 30th; Upper Lake region, 1st, 2d, 7th to 9th, 16th, 26th to 30th; Extreme Northwest, 3d, 10th, 24th, 27th, 28th, 31st; Upper Mississippi Valley, 1st, 2d, 4th, 7th, 8th, 10th, 16th, 17th, 24th to 31st; Missouri Valley, 1st, 5th, 7th, 19th, 25th to 29th; Northern Slope, 1st, 3d to 5th, 8th, 9th, 11th, 25th, 26th, 29th, 30th, 31st; Middle Slope, 1st, 2d, 5th, 10th, 26th, 30th; Southern Slope, 2d, 3d, 5th, 6th, 7th, 9th, 12th, 13th, 16th, 17th, 24th, 25th, 26th, 30th; Southern Plateau, 1st, 4th to 7th, 10th, 25th, 26th, 27th, 31st; Middle Plateau, 4th, 7th, 8th, 15th, 20th, 26th, 28th, 31st; Northern Plateau, 3d, 8th, 10th, 27th to 30th; North Pacific Coast region, 30th; Middle Pacific Coast region, 3d, 21st, 25th, 28th to 31st; South Pacific Coast region, 1st to 5th, 10th, 27th, 29th, 30th, 31st.

Solar halos have been observed in the various districts on the following dates: New England, 2d, 6th, 9th, 10th, 12th, 20th, 21st; Middle Atlantic States, 2d, 3d, 8th, 11th, 12th, 14th, 19th, 20th, 21st; South Atlantic States, 1st, 2d, 20th, 25th, 26th, 31st; Florida Peninsula, 21st, 24th, 25th; East Gulf States, 24th, 29th; Ohio Valley and Tennessee, 5th, 8th, 9th, 10th, 12th, 16th to 20th, 21st, 28th, 29th, 30th; Lower Lake region, 2d, 11th, 20th, 29th; Upper Lake region, 16th, 19th, 27th; Extreme Northwest, 10th, 18th; Upper Mississippi Valley, 1st, 3d, 7th, 8th, 10th, 16th to 19th, 24th to 27th, 29th to 31st, Missouri Valley, 9th, 25th, 26th; Northern Slope, 7th, 26th, 28th, 29th; Middle Slope, 1st, 13th, 17th, 26th, 28th, 30th, 31st; Southern Slope, 13th, 22d; Southern Plateau, 2d, 11th, 25th, 31st; Middle Plateau, 14th, 29th, 31st; Northern Plateau, 8th, 14th, 22d, 28th; Middle Pacific Coast region, 5th, 8th, 14th, 20th, 21st, 24th, 25th, 28th, 31st; South Pacific Coast region, 3d, 4th, 5th, 10th, 21st.

Mirage.—Indianola, 1st, 5th, 16th, 20th to 23d, 26th, 30th; Northport, Mich., 15th, 23d, 26th; Genoa, Nebr., 13th, portions of the city of Columbus, 19 miles distant, were distinctly visible.

MISCELLANEOUS PHENOMENA.

Earthquakes.—Eureka, Nev., December 7, very heavy shock. Kingston, Jamaica, December 26, 11.45 p. m., slight shock, lasting less than one second. Hawaii, Sandwich Islands, September 30, 5 a. m., "the most terrible shocks experienced in the past forty years. The first shock came suddenly with a quick, jerking, terrific crash, as if the foundations of everything about were shivered to pieces; this shock lasted about two minutes with an interval of nearly three minutes, when there followed a second shock similar to the first but not quite equal in terrific violence. Some light tremblings were felt during the remainder of the day and three moderate shocks on the following day. Light shocks continued at intervals to October 3, inclusive. During this period of earthquake disturbance, from September 30 to October 4, many buildings were terribly shattered; stone houses were subjected to the greatest injury; many miles of stone wall fencing were destroyed and most of the cisterns in the city shattered and deprived of water. Everything movable in the houses, such as crockery, glassware and furniture, even where the building was not particularly damaged, was jumbled and thrown together in confusion. Many buildings had from twenty to thirty cracks in the walls, while the great shock of 1868 did not disturb the walls at all.

Meteors.—Boisé City, 9th, 18th; Umatilla, 8th; Yuma, Ariz., 7th; Helena, Mont., 11th, 9.30 p. m., started from a point a little southwest of the zenith, and moved in a southwesterly direction; traversing an arc of 30°; exploded with a loud report and burst into fragments. During its flight, which lasted five seconds, the surrounding country was brilliantly illuminated. Davenport, Iowa, 6th; Madison, Wis., 10th; Little Rock, 17th; Wood's Holl, Mass., 1st; Morrison, Ill., 16th; Charleston, Ill., 23d; New Corydon, Ind., 10th, 14th, 15th; Yates Center, Kans., 8th; Dexter, Me., 11th; Rowe, Mass., 25th; Springfield, Mass., 10th; Fayette, Miss., 18th, 28th, 30th; Freehold, N. J., 11th; Palermo, N. Y., 17th; Jacksonburgh, Ohio, 24th; Fallsington, Pa., 10th.

Migration of birds.—Geese flying southward: Red Bluff, Cal., 5th, 11th; Dexter, Me., 8th; Somerset, Mass., 12th, 15th, 16th, 18th, 20th; Fall River, Mass., 20th; Austin, Tenn., 9th, 30th; Strafford, Vt., 21st. *Flying northward:* Indianola, 16th; Fort Madison, Iowa, 2d; Strafford, Vt., 22d. *Flying northeastward:* Visalia, Cal., 1st; Indianola, 26th. *Flying southeastward:* Davenport, Iowa, 22d. *Flying southwestward:* Indianola, 22d; *Ducks flying southward:* Clear Creek, Nebr., 9th. *Flying westward:* Yates Center, Kans., 12th. *Flying eastward:* Graham, Tex., 7th.

Polar bands:—Prescott, Ariz., 1st, 2d, 21st; Nashville, Tenn., 30th; Augusta, Ga., 10th; New Corydon, Ind., 16th, 17th, 18th, 25th, 29th; Guttenburg, Iowa, 1st; Dana, Iowa, 1st, 12th; Yates Center, Kans., 1st, 5th, 6th, 10th, 31st; Gardiner, Me., 2d, 9th; Clear Creek, Nebr., 1st, 4th, 5th, 6th, 17th, 18th, 19th, 21st, 26th, 27th, 30th; Freehold, N. J., 9th, 18th; Vineland, N. J., 2d, 9th, 10th.

Prairie and forest fires.—Bismarck, Dak., 16th, 17th, 18th; Fort Supply, Ind. T., 8th, 9th, 12th, 14th to 16th; Fort Gibson, Ind. T., 9th, 11th, 22d; Fort Stevenson, Dak., 5th, 12th, 17th, 23d to 26th; Yankton, 8th, 9th, 18th, 19th, 24th to 28th; Fort Totten, Dak., 22d, 25th, 26th, 27th.

Sand-storms.—San Carlos, Ariz., 14th, 15th; Camp Thomas, Ariz., 10th, 12th, 14th, 15th, 29th; Fort Garland, Colo., 28th.

Sunsets.—The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from 184 stations show 5,654 observations to have been made of which 32 were reported doubtful; of the remainder 5,622, or 86.5 per cent., were followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

Date—Dec., 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
2, 10 a. m.	2	20†					3	30†	
5, 2 p. m.	1	15			0	0	3	35†	Many of the spots small.
8, 11 p. m.	1	2			1	2	3	25†	Many of the spots small.
9, 11 a. m.	2	7	0	5	1	2	5	30†	Many of the spots small.
10, 11 a. m.	2	8	1	3	1	2	6	35†	Many of the spots small.
11, 9 a. m.	0	0	0	5	0	0	6	30†	Many of the spots small.
16, 12 m.							6	25†	Many of the spots small.
17, 10 a. m.	0	0	0	5	0	0	6	20†	Many of the spots small.
18, 2 p. m.	0	0	1	2	0	0	4	17	Many of the spots small.
19, 12 m.	0	0	1	5	0	0	3	12	
24, 3 p. m.							1	12	
25, 12 m.	0	0	0	3	0	0	1	9	
27, 2 p. m.	2	7	0	6	0	0	3	10	
28, 2 p. m.	1	4	1	2	1	2	3	12	
30, 4 p. m.	0	0	0	0	0	0	0	12	Broad areas of faculæ.
31, 4 p. m.	0	0	0	0	0	0	3	15	

†Approximated. Faculæ were seen at the time of every observation.

Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: Sun spots observed on every clear day during the month. They were largest on the 5th, 17th; smallest on the 10th; most numerous on the 15th, and least numerous on the 23d.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l., Chief Signal Officer, U. S. A.

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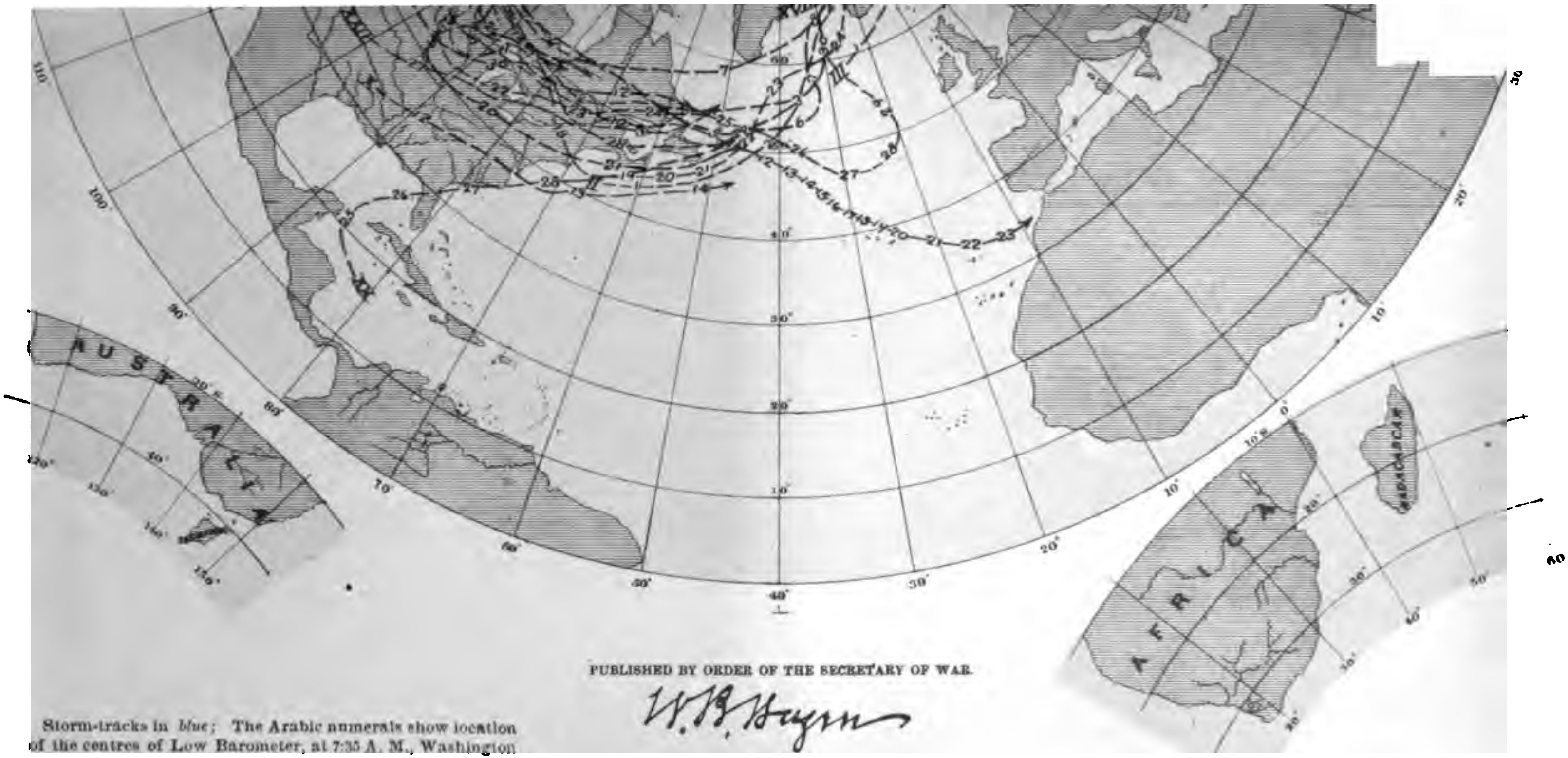


PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

Storm-tracks in *blue*; The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington **mean time, of that date.**

Broken or dotted lines, are doubtful.

INTERNATIONAL CHART.

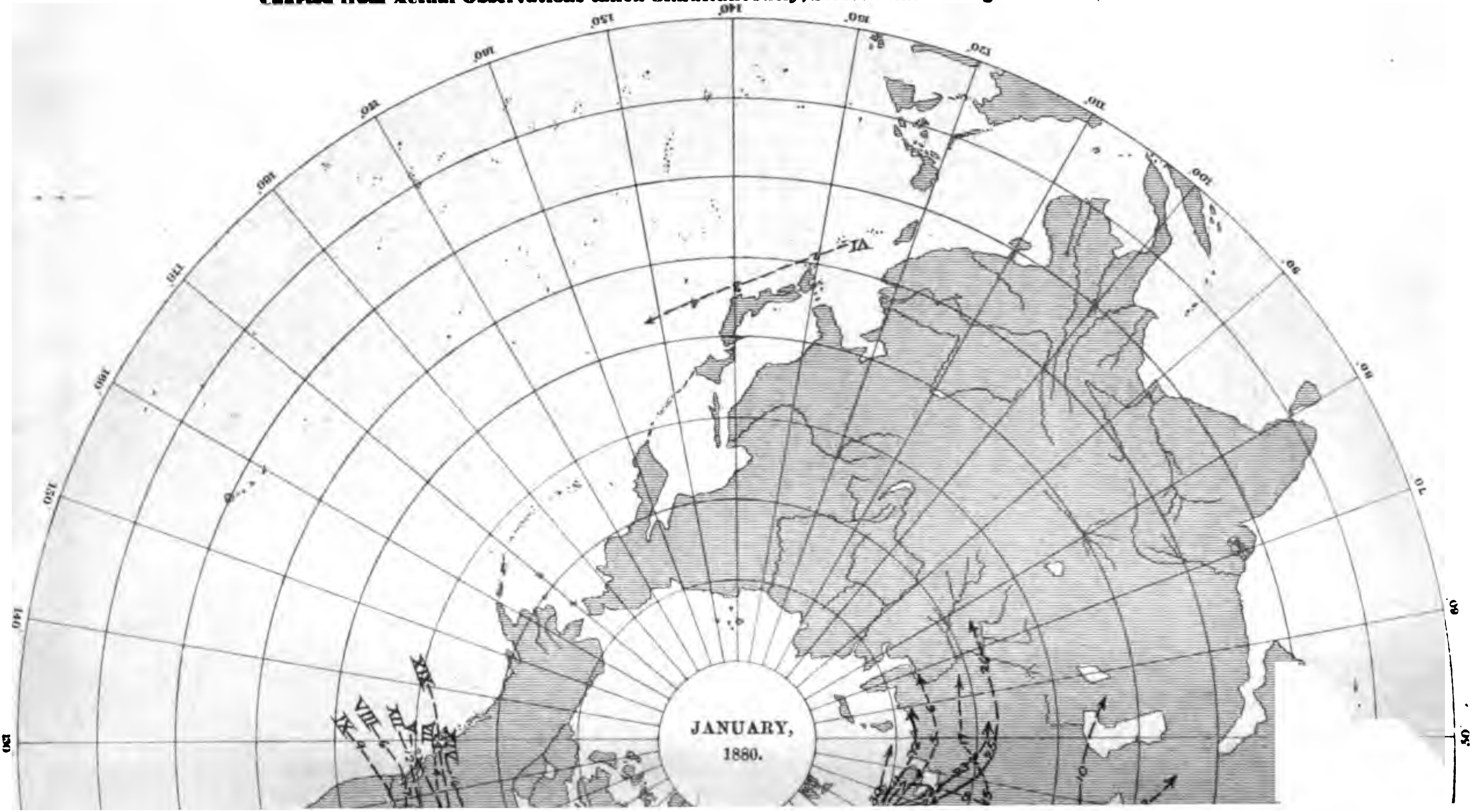
Showing Tracks of Centres of Low Barometer for January, 1880.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.



APPENDIX No. 82.

MONTHLY WEATHER REVIEW, JANUARY, 1882.

INTRODUCTION.

In preparing this Review the following data, received up to February 20, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 135 Signal Service stations and 13 Canadian stations, as telegraphed to this office; 164 monthly journals and 165 monthly means from the former, and 13 monthly means from the latter; 216 monthly registers from voluntary observers; 60 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald weather service; abstracts of ships' logs, furnished by the publishers of the New York maritime register; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railroad Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

To illustrate the subject of the distribution of mean atmospheric pressure over the United States and Canada for the month of January, 1882, Chart No. II has been prepared, upon which are traced the lines of equal barometric mean values. The areas of lowest mean pressure embrace the Lake Superior region and the Canadian maritime provinces, lowest barometers at Charlottetown, P. E. I., and Marquette, 29.92 and 30.04, respectively. In the extreme southern portion of the South Pacific Coast region the barometric mean falls to 30.03; elsewhere throughout the entire country the mean pressure ranges from 30.07 to 30.23. The two principal areas of high pressure embrace the South Atlantic States and the Middle Plateau region, highest barometers, 30.23, at Augusta and Charleston, and 30.21 at Pioche, Salt Lake City, and Eagle Rock. By comparison with the previous month, it will be noticed that the areas of maximum pressure occupy about the same regions, the western area decreasing in extent and pressure, while that to the eastward increased in extent but diminished slightly in pressure. The low area which occupied northern Minnesota and Dakota in December last moved gradually eastward into northern Canada, but the change was not sufficient to restore the natural condition in the former State, as at Saint Vincent the barometric mean value still remained 0.06 inch below the normal.

Departures from the normal values for the month.—Compared with the means of previous years, the mean pressure for the present month shows (with the exception of scattering stations) very small changes. The distribution of excess and deficiency is evenly balanced in the number of separate areas but not in the extent embraced by each. For the most part the pressure is below the normal for the month. The larger area of excess embraces the central portion of the Lake region and thence southeastward to the Atlantic coast, the departures ranging from 0.01 to 0.1 inch, being mostly, however, from 0.02 to 0.05 inch. The second area of excess includes the Middle and Northern Pacific Coast and Northern Plateau regions, where the departures range from 0.02 inch at Sacramento to 0.14 inch at Portland and Olympia. The most extensive area of deficiency, including the Eastern Gulf States and South Pacific Coast region, embraces the entire country west of the Mississippi and east of the 112th meridian, the departures ranging from 0.01 to 0.1 inch. The second and smaller area of deficiency comprises the eastern portion of the Lower Lake region, and New England north of Connecticut, departures ranging from 0.01 to 0.04 inch. Stations reporting a normal condition are as follows: Marquette, New Haven, New London, Pioche, and Smithville.

Barometric ranges.—The range of pressure for the present month has generally varied from 0.75 to 1.35 inches, and in the extremes from 0.43 inch at Key West to 1.7 inches at Barnegat. The ranges increase with the latitude throughout the entire country, and along the southern boundary of the United States, from Florida to California. Throughout the various districts the monthly barometric ranges varied as follows: New England, from 1.14 inches on Mount Washington to 1.56 inches at Eastport and 1.63 inches at Newport; Middle Atlantic States, 1.31 inches at Lynchburgh to 1.47 inches at Albany and 1.7 inches at Barnegat; South Atlantic States, 0.79 inch at Jacksonville to 1.36 inches at Kittyhawk; Florida Peninsula, 0.43 inch at Key West to 0.66 inch at Cedar

Keys; Eastern Gulf States, 0.68 inch at Pensacola to 0.78 inch at Montgomery and Vicksburgh; Western Gulf States, 0.63 inch at Indianola and Galveston to 0.83 inch at Little Rock and 1.03 inches at Fort Gibson; Rio Grande Valley, 0.54 inch at Brownsville to 0.65 inch at Castroville and 0.7 inch at Rio Grande; Ohio Valley and Tennessee, 0.9 inch at Memphis to 1.02 inches at Cincinnati and 1.3 inches at Pittsburgh; Lower Lake region, 1.12 inches at Detroit and Cleveland to 1.45 inches at Oswego; Upper Lake region, 1.17 inches at Marquette to 1.25 inches at Chicago and 1.47 inches at Alpena; Upper Mississippi Valley, 1.00 inch at Cairo to 1.21 inches at Des Moines and 1.37 inches at Madison; Missouri Valley, 0.97 inch at Springfield, Mo., to 1.11 inches at Yankton and 1.17 inches at Leavenworth and Huron; Extreme Northwest, 1.17 inches at Fort Buford to 1.21 inches at Bismarck and 1.55 inches at Saint Vincent; Northern Slope, 0.76 inch at Cheyenne to 1.00 inch at Fort Custer and 1.02 inches at Forts Assinniboine and Benton; Middle Slope, 0.67 inch on Pike's Peak to 1.03 inches at Dodge City; Southern Slope, 0.56 inch at McKavett to 0.59 inch at Fort Davis and 0.98 inch at Fort Griffin; Northern Plateau, 0.74 inch at Eagle Rock to 1.00 inch at Spokane and 1.25 inches at Umatilla; Middle Plateau, 0.69 inch at Pioche to 0.79 inch at Winnemucca and 0.8 inch at Salt Lake City; Southern Plateau, 0.42 inch at Fort Grant to 0.53 inch at Prescott and 0.68 inch at Santa Fé; North Pacific Coast region, 0.81 inch at Roseburgh to 0.97 inch at Portland and 1.18 inches at Olympia; Middle Pacific Coast region, 0.61 inch at San Francisco to 0.67 inch at Sacramento and 0.73 inch at Red Bluff; South Pacific Coast region, 0.66 inch at Visalia to 0.76 inch at Yuma and 0.8 inch at San Diego.

Areas of high barometer.—Nine such areas have been sufficiently important to merit description.

No. I.—During the 1st the pressure rapidly increased over the Lake region, Tennessee, the South Atlantic and East Gulf States. The morning map of the 2d showed a center of high barometer near Montgomery and one in the Extreme Northwest. This increased pressure in the Gulf States extended rapidly to the northeast, following the passage of low area No. I, and on the 3d joined the northern high area, which had moved eastward. On the morning of the 4th the center of high barometer was near Parry Sound, and during this day and the 5th passed over the Saint Lawrence Valley and to the eastward over Nova Scotia. A rapid fall of temperature accompanied the rise in the barometer along the Atlantic coast on the 1st and 2d. The cold wave which accompanied the high barometer that passed from the northwest did not affect stations south of latitude 40° N. The minimum temperature for the month occurred at most stations in the South Atlantic and East Gulf States on the 2d.

No. II.—During the 6th the barometer rose rapidly in Oregon and Washington Territory. This rise extended, during the 7th, over the whole country west of the Mississippi, and on the 8th the area of highest barometer was over Colorado and Kansas; it then moved into the Ohio Valley and the Lower Lake region, and thence off to the northeast. The cold wave accompanying this area was felt on the Pacific coast on the 6th, extended to the Missouri River on the 7th, and reached the Atlantic coast on the 9th. The temperature continued to fall along the Atlantic coast during the 10th.

No. III.—Appeared in Montana on the 9th, moved to the southeast during the 10th, and on the morning of the 11th was central in Kansas; in Pennsylvania on the morning of the 12th, and passed off the Middle Atlantic coast during the day. The cold wave reached the Mississippi on the 10th. From the afternoon of the 10th to the afternoon of the 11th the temperature fell from 15° to 23° in the East Gulf States and the morning map of the 12th showed a fall of from 13° to 24° in the Upper Lakes in last twenty-four hours.

No. IV.—Appeared in Washington Territory on the 12th; the increased pressure extended rapidly to the southeast. On the 13th the center of high pressure was in Kansas, and moved during the 14th to the South Atlantic coast. The temperature fell from 8° to 27° in Dakota and Montana during the 12th; this fall of temperature was felt over the Mississippi and Missouri Valleys and West Gulf States during the 13th, and over New England, the Middle and South Atlantic States on the 14th. During the 15th the pressure fell rapidly in the Lower Lake region and New England, and remained comparatively high in the South. The winds shifted to southerly, and the temperature rose from 10° to 20° in the Lower Lakes, in New England, the Middle, South Atlantic, and Gulf States.

No. V.—The barometer rose rapidly in Montana on the 14th, and on the 15th the highest pressure was over that Territory; by the 16th it had moved into Kansas; the center thence passed eastward to the Middle Atlantic coast and up the coast to Nova Scotia. The cold wave was felt over the whole United States. Starting in Montana on the 14th, it soon extended from British America to the Gulf of Mexico, and passed eastward, reaching the Atlantic coast on the 17th. From the morning of the 16th to the morning of the 17th the temperature fell 44° at Denison, 36° at Indianola, from 35° to

40° in the Ohio Valley, and from 20° to 36° in the Middle Atlantic States and New England on the 17th.

No. VI.—An area of high barometer that had advanced from the Northwest was found on the morning of the 19th as an area of 30.30 over Missouri, Iowa, and Illinois. The center of high pressure moved rapidly to the northeast, and on the morning of the 20th the highest pressure was over Nova Scotia. During the night of the 17th the temperature fell from 15° to 25° in Dakota and Montana, and from 6° to 14° in the Upper Lake region the next night. No marked changes were observed in the Lower Lake region. The cold wave reached the Atlantic coast on the afternoon and night of the 19th, causing a fall of from 10° to 20° in the Middle Atlantic and New England States, and Canadian maritime provinces.

No. VII.—On the morning of the 21st the highest barometer was in northwestern Dakota, where the pressure had increased from 0.68 to 0.76 inch in last twenty-four hours. On the morning of the 22d the area of highest pressure was over Manitoba; it reached the Saint Lawrence Valley on the 24th, and then moved to the southeast, and on the morning of the 25th was over the New England coast. The winds shifted to the northwest in the Upper Lake region on the 21st, the Lower Lakes and Middle Atlantic States on the 22d, and in New England on the 23d. Snow fell in the Lake region on the 21st, 22d, and 23d. In New England and the Middle Atlantic States the weather generally cleared as soon as the wind had shifted to northwest. In its progress this area was accompanied by very low temperatures. The minimum temperatures for the month occurred at most stations in the Lake region, New England and Middle Atlantic States on the 24th.

No. VIII.—The barometer rose from 0.38 inch to 0.46 inch in Montana on the 25th. This increased pressure extended rapidly to the south and east, and at midnight of the 26th the highest barometer was at Leavenworth. The center of highest pressure then passed rapidly to the Lower Lake region, and thence to the northeast over the Canadian maritime provinces. At midnight of the 25th the temperature had fallen from 20° to 30° in Montana in last twenty-four hours. The cold wave extended south to Mexico; it then moved eastward reaching the Atlantic coast on the 27th.

No. IX.—On the morning of the 28th an area of high barometer was central in the Upper Missouri Valley, and a marked fall in temperature occurred in the Upper Mississippi and Missouri Valleys and northwest districts. This high barometer moved down the Missouri Valley. The highest barometer was at Leavenworth on the morning of the 29th. It then moved east to the Atlantic coast, which it reached on the 30th. A marked fall in temperature was felt in all districts. As this area passed over the Upper Missouri Valley the minimum temperatures for the month occurred on the 28th.

Areas of low barometer.—Fourteen areas of barometric minima appeared within the limits of the Signal Service stations during the month of January, 1882. Chart No. I shows the paths of thirteen of these areas. No. VIII is not charted.

No. I.—On the 30th of December, 1881, the barometer fell rapidly in Texas. This fall extended eastward the next day, and at midnight of the 31st a storm center was located in northeastern Georgia. The morning map of January 1 showed the center to be near Smithville, N. C. It then passed to the northeast, accompanied by high winds, heavy rain and snow along the Atlantic coast. Snow also fell in the Lake region. The following high velocities were noted during the passage of this storm: Hatteras, NW., 32 miles; Kittyawk, N., 48 miles; Cape Henry, NW., 52 miles; Delaware Breakwater and Sandy Hook, N., 43 miles. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicates the presence of this storm during its passage eastward over the ocean: Steamship Assyria, 1st, a. m., in 35° 21′ N., 66° 10′ W., 30.20, W., force 6, clear and fine; p. m., in 35° 42′ N., 67° 28′ W., 29.88, SSE., force 8, overcast and threatening. 2d, in 36° 13′ N., 68° 13′ W., 29.90, W., force 9, heavy squalls, thunder and lightning; p. m., in 36° 26′ N., 69° 07′ W., 29.90, force 8, overcast and squally, high confused sea. 3d, a. m., in 37° 32′ N., 70° 35′ W., 30.10, WNW., force 6, sea covered with driving vapor of warm water followed by squally weather and hail. Steamship Acapulco, 1st, in 34° N., 74° 18′ W., 29.82, a fall of 0.42 inch in past twenty-four hours, WSW., force 9, heavy squalls of wind and rain. 2d, in 37° 20′ N., 73° 48′ W., 30.25, NNW., force 6, snow squalls, heavy sea swell from northeast.

No. II.—Appeared in Texas on the 3d. It moved to the northeast with increasing pressure during the 4th, and disappeared as a storm center on the 5th, in Ohio. Rain fell in the Gulf States and Tennessee, and snow in the Ohio Valley and Lake region.

Nos. III and IV.—No. III appeared on the coast of Washington Territory on the morning of the 4th. On the 5th it was near Fort Garry, southeast to southwest winds, with cloudy weather, prevailing in the Lake region and the Upper Mississippi and Missouri Valleys. On the 6th it rained or snowed in all districts east of the Mississippi River. On the 7th the center passed to the east of Nova Scotia. On the morning of this day area No. IV appeared in Iowa, and the rains of the 6th continued during the 7th and 8th. This area moved north and east and disappeared over the Gulf of Saint Lawrence on the afternoon of the 9th. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: Steamship Zeeland, 7th, in 42° 11′ N., 61° 19′ W., 29.50, a fall of 0.65 inch in past twenty-four hours, variable winds; 8th, in 41° 13′ N., 64° 48′ W., 29.95, NNW., moderate gale, high westerly sea; 9th, in 40° 47′ N., 69° 46′ W., 29.62, SW., fresh gale, dense fog for seven hours. Steamship Celtic, in 42° 24′ N., 61° 02′ W., 29.85, a fall of 0.51 inch in past twenty-four hours, S., force 4, rain.

No. V.—On the morning of the 10th this area was central in Texas, accompanied by rain in the North Atlantic and Gulf States, Tennessee, and the Ohio Valley. This storm moved rapidly to the Lower Lake region and thence to the northeast. General and heavy rains in all districts east of the Mississippi, clearing in New England on the 12th, and in other districts the day before. Wind velocities of 27 to 40 miles were reported from the New England, Middle, and South Atlantic coasts. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: Steamship City of Montreal, 12th, in 44° 31′ N., 49° 56′ W., NW. to NE. strong gales, high head sea; 13th, in 43° 06′ N., 56° 01′ W., E. to NNW. strong gales, heavy snow squalls, high beam sea.

No. VI.—Advancing from the southwest, this area was central near Leavenworth at midnight of the 12th. Rain had fallen during the day in all districts east of the Mississippi; these rains continued during the 13th. The winds had shifted to westerly, and by midnight of the 14th clear weather prevailed in nearly all districts. On the afternoon of the 15th a new area (No. VIII, not charted) appeared near Leavenworth, and following after No. VI caused general and heavy rain or snow in the same districts as No. VI. The rain continued in New England, the Middle, South Atlantic, and Gulf States, Tennessee, and the Ohio Valley, and Lower Lake region until the 17th. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: Steamship City of Montreal, 14th, in 42° 12′ N., 61° 18′ W., NNW. to S. and NW., fresh to strong gales, high head sea; 15th, in 41° 01′ N., 65° 17′ W., WNW., heavy gale, high head sea; 16th, in 40° 40′ N., 71° 11′ W., strong westerly winds, fine weather. Steamship Britannic, 14th, in 42° 02′ N., 62° 42′ W., 29.13, a fall of 0.67 inch in past twenty-four hours, W., force 6; 15th, in 40° 46′ N., 69° W., 29.91, WSW., force 3.

No. VII.—This area could only be approximately traced, as its path was north of our stations of observation; it was of slight energy, and had but little effect on the weather in the United States.

No. IX.—Was central near Fort Garry on the afternoon of the 17th. During the remainder of this day and the 18th it moved eastward as far as Rockliffe, accompanied by very little rain, the winds in the Lake region and Mississippi Valley being from southwest to northwest. A secondary depression that had moved up from the Gulf of Mexico on the 18th caused rain in the Middle and South Atlantic States and Tennessee. By the morning of the 19th this secondary depression had moved into New England and joined No. IX, which was then central in the Saint Lawrence Valley, and at midnight generally fair weather prevailed. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: Steamship Adriatic, 19th, in 43° 04′ N., 57° 55′ W., north to variable, fresh gales, snow squalls; 20th, in 41° 30′ N., 64° 34′ W., variable winds, squally, with hail. Steamship Waesland, 19th, in 42° 28′ N., 60° 05′ W., 29.94, a fall of 0.18 inch in past twenty-four hours, NW. to S., strong winds with thick weather; 20th, in 41° 01′ N., 65° 11′ W., 30.28, SW. to NE., first part of day stormy with very high sea, followed during afternoon by pleasant weather.

No. X.—Appeared in the Extreme Northwest on the morning of the 20th. On the morning of the 21st the center was near Marquette, and snow had fallen in the Lake region. During this day and the 22d it moved east and north to the Saint Lawrence Valley, accompanied by snow. The weather generally cleared on the 23d. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: Steamship Lake Champlain, 22d, noon, in 43° 30′ N., 55° 49′ W., 29.38, a fall of 1.00 inch in past twenty-four hours, SSW., force 4, heavy southerly sea; midnight, barometer 29.40, wind SW., force 9; 23d, noon, in 42° 57′ N., 58° 47′ W., 29.40, W., force 9, high confused sea; midnight, 29.77, W., force 10; 24th, noon, in 42° 18′ N., 61° 09′ W., 30.00, WNW., force 9; midnight, 30.40, NW., force 5. Steamship Bothnia, in 43° 04′ N., 54° 50′ W., 29.56, a fall of 0.80 inch in past twenty-four hours, S., force 6, thick misty weather; 23d, in 42° 01′ N., 59° 38′ W., 29.57, W., force 11 (violent hurricane), very high westerly sea, dark cloudy sky, with heavy hail squalls; 24th, in 41° 10′ N., 63° 25′ W., 30.14, NW., force 8, very high sea, cloudy, with constant snow squalls; 25th, in 40° 42′ N., 68° W., 30.50, W., force 3, fine, clear weather.

Nos. XI and XII.—No. XI appeared in Montana on the 24th. Rain and snow fell in the Upper Mississippi and Missouri Valleys and the Extreme Northwest on this day. On the 25th the center moved into the Lake region, and general and heavy rains occurred in all districts east of the Mississippi. The center passed over New Brunswick on the 26th. On the morning of this day, when the center was near Rockcliffe, No. XII appeared central in Iowa, and moved across the Lake region and into the Province of Ontario. The rains which began with No. XI continued during the passage of this storm on the 26th. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Republic, 29th, in 49° 34′ N., 37° 55′ W., 28.89, a fall of 1.17 inches in past twenty-four hours, SSW., force 7; 30th, in 48° 15′ N., 42° 54′ W., 29.22., SSE., force 6, sleeting; 31st, in 46° 33′ N., 47° 31′ W., 29.59, WSW., force 7, hazy.

No. XIII.—The center of this area was first located near Duluth, on the midnight map of the 27th. Cloudy weather and light rain in the Lake region, and general rains and snow in New England prevailed on the 28th. By the morning of the 29th the winds had shifted to west and northwest. Snow fell during the day in New England and the Lower Lake region; weather generally clearing by midnight.

No. XIV.—The storm moved up from the Gulf of Mexico on the 30th, causing heavy rains in the South Atlantic and Gulf States during the day. On the morning of the 31st it appeared as an area of low barometer, central in Kentucky, and snow had fallen in the Middle Atlantic States; this snow continued and extended to New England on the 31st; the weather cleared in the South Atlantic and Gulf States on this date. Cautionary signals were ordered for this storm on the morning of the 31st, and were justified by the following maximum velocities: Hatteras, SW., 42 miles; Kittyhawk, S., 36 miles: Cape Henry, E., 36 miles; Delaware Breakwater, E., 40 miles; Sandy Hook, E., 54 miles; New York, NE., 41 miles; Eastport, NE., 38 miles; and by velocities of more than 25 miles at a large number of other stations on the coast. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Wyoming, 30th, in 44° 44′ N., 54° W., SE. to NW., moderate breeze to hard gale, with frequent snow squalls; 31st, 43° 12′ N., 57° 33′ W., NW., fresh to strong gale and squally, high sea; February in 42° N., 63° 35′ W., SE to NW., strong gales, cloudy with heavy rain; 2d, in 40° 38′ N., 69° 37′ W., N. to W., heavy gale, with moderate breeze, fine weather.

INTERNATIONAL METEOROLOGY.

International Charts Nos. IV and V accompany the present Review for January, 1882. The former is published for November, 1879, and continues the series of this chart commenced in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean," kindly furnished this office through the courtesy of Prof. Dr. G. Neumayer, director of the German Marine Observatory, has not been used in the preparation of Chart No. IV, owing to unavoidable delay in the receipt of the data. Chart No. V is prepared for the month of February, 1880, and continues the series of this chart commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature, and prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of November, 1879, over the Northern, and at certain isolated stations in the Southern Hemisphere. There are no marked centers of barometric minima for the present month, owing to a more uniform distribution of mean atmospheric pressure, particularly over the land areas. Three areas of comparatively low pressure are distributed as follows: one between the Azores and Madeira Islands, barometer 29.90; another over the Okhotsk Sea, barometer 29.90, and the last central over Greenland, the isobar of 29.80 passing thence northeastward north of parallel 70° N. to northern Scandinavia and Lapland. The continued progress of areas of high pressure from the region of the Azores northeastward over Northern Europe effected a very marked change in the distribution of mean atmospheric pressure off the western coast of that country. The unvarying conditions of the past six months or more have finally been reversed by the formation of an area of barometric maxima over the British Isles and one of barometric minima over the Azores. There are four principal areas of high pressure for the month, distributed as follows: in Central Mexico, 30.30; off the western coast of Ireland, 30.30; in southeastern Siberia, 30.30; in the southeastern portion of the United States, 30.20. The extreme mean pressures for the month are, 29.71 (lowest) at Godthaab and 30.34 (highest) at Mexico. The extreme monthly range of mean pressure is 0.63 inch, which is 0.63 inch smaller than the range for November, 1877, and 0.68 inch smaller than for the same month in 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: Lowest—York Factory, 3°; Nertchinsk, 8°; Yeniseisk, 9°; Nikolaievsk, on the Amoor, 13°; Archangel and Barnaul, 14°; Fort Garry and Haparanda, 15°; Moose Factory, 18°; Ekaterinburg. 19°. Highest—Free Town, 86°; Paramaribo, 83°; Manilla, 81°; Bridgetown, 80°; Poona, 79°; Bombay, Fort de France, Mauritius, and St. Thomas, 78°; Nassau and Santiago de Cuba, 76°; Havana, 75°. The prevailing direction of the winds over the United States was northeast to northwest in the Atlantic Coast States; southerly in the Gulf States, Ohio Valley, and Tennessee; southwest to northwest in the Lake region; northwesterly in the Upper Mississippi and Missouri Valleys and Northwest; variable in the Plateau and Pacific Coast regions; over Canada and in the maritime provinces, north to west; in Central Mexico, calms; over the Atlantic Ocean, northeasterly from the European coast westward to near 40° W. and from the American coast eastward to same parallel, northeast to northwest and southwest; in Europe, northeast to northwest, except southerly along the Norway coast and in Central Russia; in Algiers, northeast to northwest; in Hindostan, northerly; along the Asiatic coast and over the Japan Islands, northeasterly. Compared with November, 1877 and 1878, the temperature over the United States is generally lower except in the Gulf and South Atlantic States, where the isotherm of 60° nearly replaces that of 50° in the two previous years. In barometer there is a marked rise in the Gulf and South Atlantic States, an area of 30.20 replacing that of 30.10; elsewhere there is but little change. Over the Atlantic the change in pressure is a very marked one, particularly in that region included between the parallels of 45° and 65° N. and the meridians of 10° and 35° W., where, as compared with November, 1877, the isobar of 30.30 replaces that of 29,40, and as compared with November, 1878, it replaces that of 29.90. In the region of the Azores there is a decided fall, amounting to over 0.2 inch, while off the American coast in the vicinity of 35° N., 70° W. a very noticeable rise occurs. With respect to temperature there is a general rise north of parallel 40°, increasing slightly with the latitude; elsewhere the changes are unimportant. In the various countries of Europe and Asia the following changes appear: British Isles, temperature slightly lower and the pressure from 0.45 to 0.73 inch higher. Scandinavia and Denmark, temperature from 5° to 12° lower and the pressure from 0.20 to 0.35 inch higher. France, temperature from 1° to 7° lower and the pressure from 0.28 to 0.33 inch higher. Germany, temperature from 5° to 7° lower and the pressure from 0.20 to 0.25 inch higher. Austria, temperature from 7° to 14° lower and the pressure from 0.05 to 0.07 inch higher. Spain and Portugal, temperature from 4° to 6° higher with an increase of pressure of from 0.01 to 0.04 inch. Italy, temperature from 1° to 3° lower and the pressure from 0.01 to 0.07 inch higher. Algeria, temperature from 1° to 7° higher with an increase in pressure of 0.05 to 0.12 inch. Turkey, temperature slightly higher and the pressure from 0.01 to 0.05 inch lower. British India, temperature from 1° to 4° lower, while the pressure shows little or no change. Russia and Siberia, temperature from 1° to 5° lower and the pressure from 0.01 to 0.04 inch higher. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of November, 1879, as compared with the means of the past two years:

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.		
	November, 1877-'78.	November, 1879.	Departure.	November, 1877-'78.	November, 1879.	Departure.
	°	°	°			
York Factory	15.0	2.9	+12.1	29.95	30.11	+0.16
Godthaab	28.0	26.8	− 1.2	29.73	29.71	−0.02
Stykkisholm	31.0	37.0	+ 6.0	29.68	29.96	+0.28
Tromso	32.2	28.9	− 3.3	29.51	29.76	+0.25
Thorshavn	39.4	41.5	+ 2.1	29.55	30.13	+0.58
Archangel	31.3	14.0	−17.3	29.76	29.84	+0.08
Ekaterinburg	29.1	19.0	−10.1	30.18	30.02	−0.16
Barnaul	21.0	14.4	− 6.6	30.36	30.22	−0.14
Yeniseisk	11.3	9.3	− 2.0	30.31	30.19	−0.12
Nikolaievsk on the Amoor	8.9	13.3	+ 4.4	....	....	....
Zi-Ka-Wei	58.6	52.3	− 6.3	30.32	30.23	−0.09
Tokei	47.6	46.8	− 0.8	30.12	30.10	−0.02
Pekin	35.3	38.7	+ 3.4	30.32	30.27	−0.05
Tashkend	40.9	44.4	+ 3.5	30.46	30.24	−0.22
Nukuss	41.7	42.8	+ 1.1	30.29	30.19	−0.10
Beirut	73.4	70.3	− 3.1	30.04	30.04	Norm'l

Comparative thermometric and barometric means, &c.—Continued.

Station.	Mean temperature.			Mean barometer.		
	November, 1877-'78.	November, 1879.	Departure.	November, 1877-'78.	November, 1879.	Departure.
	°	°	°			
Mauritius	78.2	77.9	+ 0.3	30.02	30.05	+0.03
Fort Napier	77.2	77.1	— 0.1	29.81	29.78	—0.03
Cape Town	72.9	72.6	— 0.3	30.02	30.01	—0.01
Free Town	85.9	86.4	+ 0.5	29.93	29.94	+0.01
Paramaribo	83.1	82.8	— 0.3	29.97	29.95	—0.02
Funchal	70.1	69.6	— 0.5	30.09	29.88	—0.21
Ponta Delgado	65.3	65.1	— 0.2	30.14	29.91	—0.23
Angra	62.3	62.6	+ 0.3	30.14	29.91	—0.23
Bridgetown	81.6	80.2	— 1.4	29.91	29.91	Norm'l
Navassa	81.5	79.7	— 1.8	29.92	29.91	—0.01
Medellin	66.3	65.4	— 0.9	....	....	....
San José de Costa Rica	64.8	66.6	+ 2.3	....	....	....
Mexico	49.2	46.6	- 2.6	30.25	30.29	+ 0.04
Melbourne	55.8	57.0	+ 2.2	29.96	29.82	- 0.14
Hobart Town	54.3	55.4	+ 1.1	29.67	29.66	- 0.01
San Juan de Puerto Rica	78.7	78.1	- 0.6	29.90	29.98	+ 0.08
Nassau	74.9	75.7	+ 0.8	30.02	30.09	+ 0.07
Havana	74.9	74.9	Norm'l	29.98	30.06	+ 0.08
Astrakhan	44.8	40.5	- 4.3	30.25	30.19	- 0.06
Athens	63.6	60.1	- 3.5	30.04	30.02	- 0.02
Lahore	69.0	65.5	- 3.5	29.97	30.00	+ 0.03
Tiflis	55.5	54.0	- 1.5	30.20	30.15	- 0.05
Laghouat	61.1	66.4	+ 5.3	30.07	30.15	+ 0.08
Fort de France	79.8	77.7	- 2.1	29.83	29.93	+ 0.10
Lisbon	58.3	61.7	+ 3.4	30.07	29.98	- 0.09
Madrid	51.6	56.1	+ 4.5	30.02	30.04	+ 0.02
Cagliari	63.1	62.1	- 1.0	29.95	29.96	- 0.01
Gibraltar	....	....	....	30.04	29.96	- 0.08
Sandwick Manse	42.0	43.5	+ 1.5	29.55	30.22	+ 0.67
Malta	68.3	64.9	- 3.4	29.97	29.98	+ 0.01

Chart No. V.—This chart displays the tracings of the probable courses of twenty of the principal storm areas of the Northern Hemisphere for the month of February, 1880. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data, which reaches this office in various ways, from the logs of vessels of the merchant marine of the North Atlantic and North Pacific Oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given: one area crossed southern Greenland from the northern portion of the British possessions. Fifteen areas traversed portions of the United States, five of which came from the Pacific Ocean, five from the British possessions, and one from the Gulf of Mexico. Twelve of these areas reached the Atlantic Ocean, five of which crossed the same to the mainland of northern Europe. Over the ocean, one area first appeared south of Greenland, two off the northwestern coast of Norway, and one north of the Azores. Of the storms in North America, the following detailed descriptions are given: No. I.—This depression is charted as a continuation of area No. XXI, of the January, 1880, chart. Central morning of the 1st in the lower Saint Lawrence Valley, it moved rapidly eastward during the day, and by the following morning was central off the banks of Newfoundland. 2d, in 44° 20′ N., 43° 57′ W., 29.35, W., force 5, vessel had just passed storm center; in 46° 13′ N., 39° W., WSW., strong gale, high sea; in 46° 25′ N., 41° W., NW, strong gale, high sea. Throughout the Canadian maritime provinces the winds were northwesterly, with increased force, and an area of 30.40 rapidly approached from the Province of Quebec. During the day the course of the depression curved to the NNE., and by the morning of the 3d it had combined with area No. III, then central between Greenland and Iceland. No. II.—This depression appeared in the Western Gulf on the 1st. In central and southern Texas rain and snow, with northeast to northwest winds, prevailed during the day. To the northward a high pressure area of 30.40 and above extended over the Mississippi and Missouri Valleys to Manitoba. On the 2d the depression was central off the coast of Louisiana, and rain was quite general throughout the Gulf States; New Orleans, 29.62, a fall of 0.53 inch in past twenty-four hours, wind shifted from NE. 10 miles per hour to E. 29 miles, weather changed from cloudy to heavy rain; Galveston, 29.87, a fall of 0.29 inch, W., 22 miles per hour, threatening. During the day the depression passed rapidly northeastward over the northern portion of the Eastern Gulf States, and on the morning of the 3d was central in southeastern Virginia; Washington, D. C., 29.33 a fall of 1.16 inches, N., light rain; Norfolk, 29.35, a fall of 1.01 inches, SW., 28 milse per hour, fair; Lynchburg, 29.43, a fall of 1.02 inches, NW., light snow; Baltimore, 29.32, a fall of 1.19 inches, E., light rain; Cape May, 29.24, a fall of 1.24 inches, E. twenty-four miles per hour, foggy; Cape Hatteras, 29.42, a fall of 0.89 inch, W., 34 miles, light rain, 3.54 inches rainfall in past twenty-four hours; Portsmouth, N. C., 2.98 inches rainfall in past twenty-four hours; Cape Lookout, N. C., 2.91 inches rainfall in past twenty-four hours. Off the Middle Atlantic coast heavy northeast to southeast gales prevailed. In 37° N., 71° 30′ W., heavy gale from ESE. to WSW. veering to W., lasting twenty-six hours, heavy sea and snow squalls, vessel before wind under bare poles for ten hours, lost deck load; in 38° 40′ N., 73° W., heavy gale from NE. to NW., increasing at 2 p. m. to violent hurricane; off Fire Island, terrific gale from E. veering to NW. and increasing to hurricane with high sea; off Cape Fear, heavy gale from E. veering to S. and W.; in 42° N., 62° 24′ W., NW., heavy gale; in 41° N., 67° W., NE. to SE., strong gale and snow; in 38° N., 69° 30′ W., heavy westerly squalls and high sea. 4th, depression central over the Gulf of Saint Lawrence. Sydney, N. S., 29.15, a fall of 1.28 inches, SW., twenty-four miles per hour, cloudy; Charlottetown, Prince Edward Island, 29.06, a fall of 1.35 inches, NE., light snow; Little Glace Bay, N. S., 29.12, a fall of 1.29 inches, SE., cloudy; Windsor, N. S., 29.27, a fall of 1.14 inches, SW., snow. Snow, with southwest to northwest winds, was quite general throughout the Canadian and maritime provinces. Over the ocean between the parallels of 40° and 50° N., and west of 40° W., heavy westerly gales were experienced. In 41° N., 66° 40′ W., SE. to WNW., heavy gales, high confused sea; in 43° N., 52° W., heavy southwesterly gale; in 41° N., 58° W., violent westerly gale, vessel dismantled; in 42° 15′ N., 46° 55′ W., succession of violent gales from SW. to WNW., with high confused sea; 5th, depression central in about 40° N., 50° W.; in 50° 38′ N., 42° 15′ W., 29.13, W., force 7, heavy westerly squalls, high confused sea; in 51° 30′ N., 42° 20′ W., 29.10, SW., force 8, heavy rain squalls; in 46° 20′ N., 46° 10′ W., 29.65 WSW., force 4, rain; in 45° 24′ N., 46° 17′ W., WNW., strong gale, high sea; in 42° N., 42° W., moderate westerly gale, hard squalls; in 48° N., 33 W., WNW., W. and SW., strong gales, gloomy weather, heavy sea; in 48° N., 35° W., SW. and W., heavy gale, high confused sea; in 48° N., 30° W., NW., stormy, high sea, much water on deck; in 45° 09′ N., 49° 22′ W., heavy SW. gale with tremendous sea. 6th, depression central southwest of Iceland. The following observations were reported from Stykkisholm during the approach and passage of the depression: 5th, 29.13, SW., force 6, snow; 6th, 28.38, NE., force 7, snow; 7th, 28.54, NE., force 8, snow; 8th, 28.88, SE., force 2, snow; 9th, 28.88, N., force 6, fair; 10th, 29.10, E., force 6, clear. The following observations were reported from Godthaab during the approach and passage of the depression: 5th, 29.58, NE., force 4, clear; 6th, 29.50, NNE., force 4, clear; 7th, 29.37, NW., force 3, fair; 8th, 29.26, NNW., force 4, clear; 9th, 29.24, N., force 4, snow. On the 6th, the pressure throughout the British Isles fell to 29.80 and below, showing a change of from 0.10 to 0.60 inch in previous twenty-four hours. The winds shifted to south and southeast with increased energy, and rainy or threatening weather generally prevailed. At North Unst the barometer fell to 28.85, a change of 0.55 inch in past twenty-four hours, wind SW., force 8; Thorshavn, 28.97, a fall of 0.59 inch, SSE., force 8, fair. 7th, North Unst, 28.88, SW., force 7; Thorshavn, 28.66, W., force 8. 8th, North Unst, 29.20, W., force 4; Thorshavn, 29.19, SSW., force 2. 9th, North Unst, 29.48, S., force 2; Thorshavn, 29.37, S., force 4. Along the Norway coast the barometer ranged on the different dates as follows: 6th, from 29.50 at Tromso to 29.81 at Bergen; 7th, from 29.04 at Brono to 29.32 at Bergen; 8th, from 29.16 at Tromso to 29.29 at Brono; 9th, from 29.30 at Tromso to 29.57 at Bergen. From the 6th to the 8th inclusive, rain or snow prevailed throughout Norway, with strong southerly winds. During the 9th the depression passed northeastward over northern Scandinavia and by the following morning was central near the White Sea. Archangel, 29.62, SSW., force 4, snow. Passing rapidly southeastward the depression was central morning of the 11th near 60° N., 80° E. Barnaul, 29.45, a fall of 1.05 inches, SW., cloudy; Yeniseisk, 29.58, a fall of 0.79 inch, calm, clear. During the day the depression disappeared in central Siberia under the influence of a high pressure area, 30.60. No. III.—This depression appeared on the 1st south of Greenland as a continuation of area No. XXI, chart No. V, January, 1880. In studying the development of this storm it was deemed advisable to withhold what could only be a partial description with the January chart, and embody the whole in an unbroken narrative accompanying Chart No. V, for February. Accordingly the incipient stages of the depression are described as follows: developed slowly in the Plateau regions during the 25th, 26th, and 27th of January, as the result of extended atmospheric changes accompanying the formation and progress of areas Nos. XIX and XXII, January chart. Light rain and snow with variable winds attended its dilatory movement in these regions. The progress of the depression to the eastward for the first three or four days was much delayed owing to the sluggish movement from the British Possessions of a high pressure area in rear of depression No. XIX. By the morning of the 29th the high barometer (30.60) had moved to the Lake region, while the depression assumed a more decided form and became central in the Middle Slope; lowest barometer at Denver, 29.60, a fall of 0.34 inch, S., clear. During the day the depression moved rapidly northeastward, with increasing energy toward the Upper Lake region, and by the morning of the 30th was central in northern Wisconsin, while the high area above referred to embraced the Middle Atlantic States, New England, and the Canadian maritime provinces. Lowest barometer at Escanaba, 29.48, a fall of 1.20 inches, SW., light rain; Marquette, 29.51, a fall of 1.13 inches, S., cloudy; Milwaukee, 29.65, a fall of 0.88 inch, SW., light rain. 31st, depression central over the Gulf of Saint Lawrence, followed throughout the Lake region, Ohio Valley, Canada and the Middle Atlantic States by westerly winds, with occasional light rain and snow. Lowest barometer at Dalhousie, N. B., 29.22, a fall of 1.50 inches, W., fair; Bathurst, N. B., 29.20, a fall of 1.46 inches, SW., clear; Chatham, N. B., 29.30, a fall of 1.43 inches, SW., cloudy; Little Glace Bay, N. S., 29.40, a fall of 1.15 inches, S., raining. Although the fall in pressure was remarkable and sudden, yet the precipitation accompanying the depression on this day, though quite general, was very light. The highest wind velocities were reported as follows: Mount Washington, NW., 72 miles; Boston, W., 45; Father Point, N., 42; Yarmouth, N. S., SW., 36; Cape May and Newport, SW., 32; Montreal and Sandy Hook, W., 28. February 1, depression central south of Greenland. Godthaab, 28.97, a fall of 0.04 inch, ENE., force 4, cloudy; Stykkisholm, 29.10, a rise of 0.43 inch, SW., force 7, snowing. 2d, Godthaab, 28.94, a fall of 0.03 inch, NNE., force 4, cloudy; Stykkisholm, 28.90, a fall of 0.20 inch, SW., force 4, snowing. 3d, Godthaab, 29.22, a rise of 0.28 inch, SW., force 6, snowing. Stykkisholm, 29.22, a rise of 0.32 inch, SW., force 6, snowing. During the day the area moved northeastward beyond Iceland, being central on the 4th in about 67° N., 10° W.; Stykkisholm, 29.24, SW., force 4, snowing; Thorshavn, 29.62, a fall of 0.11 inch, W., force 5, cloudy; North Unst, 29.83, a fall of 0.03 inch, SW., force 6, cloudy. 5th, depression central, with diminished energy, off the northwestern coast of Norway. Tromso, 29.09, a fall of 0.15 inch, SW., snowing; Haparanda, 29.28, a fall of 0.36 inch, SW., clear; Brono, 29.25, a fall of 0.38 inch, NNE., rain and snow; Bergen, 29.54, a fall of 0.55 inch, S., 35 miles per hour, raining. During the day the depression passed rapidly southeastward over northern Scandinavia and Finland, and by the morning of the 6th was central south of the White Sea, inclosed by the isobar of 29.40. To the westward the winds shifted to northwesterly, with increased force, but accompanied by only a slight rise in pressure, owing to the rapid advance and extended influence of area No. II. The following low pressures were reported from northwestern Russia: Archangel, 29.56, NNE., 18 miles per hour, snowing; St. Petersburg, 29.35, a fall of 0.37 inch, WNW., 29 miles per hour, cloudy; Dorpat, 29.64, a fall of 0.28 inch, WSW., fair; Moscow, 29.68, a fall of 0.19 inch, S., cloudy. The changes in pressure over this region are not very marked, owing to the recent passage of area No. V. 7th, depression central, with greatly increased energy in western Siberia; lowest barometer at Ekaterinburg, 28.83, a fall of 0.49 inch, WSW., 31 miles per hour, drifting snow; this is one of the lowest pressures reported from Ekaterinburg for several years, and was doubtless due to the rapid succession of areas Nos. III, IV, and V over that region. Kasan, 29.42, a fall of 0.08 inch, NNW., 27 miles per hour, clear; Krotkowo, 29.55, a fall of 0.11 inch, N., cloudy. 8th, depression central in the valley of the Obi; Ekaterinburg, 30.16, a rise of 1.33 inches, W., 18 miles per hour, clear; Barnaul, 29.76, a fall of 0.12 inch, SW., 22 miles per hour, cloudy; Yeniseisk, 29.56, a fall of 0.39 inch, S., 11 miles, snowing. 9th, depression central in the valley of the Yenisei; Barnaul, 29.57, a fall of 0.19 inch, W., 13 miles, cloudy; Yeniseisk, 29.73, a rise of 0.17 inch, WSW., 20 miles, snowing. During the day the depression disappeared in a high pressure area over central Siberia. 10th, Barnaul, 30.50, SW., cloudy; Yeniseisk, 30.37, calm, clear. No. VI.—This depression appeared to form over the Northern Slope during the 3d, and by the following morning was central in Dakota, accompanied by snow and southwest to northwest winds. Displaying but very little energy it moved eastward during the day, and by the morning of the 5th was central north of Lake Superior. Moose Factory, 29.87 N., cloudy. During the day the depression disappeared over northern Canada, accompanied by snow in the Lower Lake region and New England, winds shifting to west and northwest, with rapidly rising pressure. No. VII.—This depression first appeared in the Saskatchewan Valley on the 5th, thence moved rapidly southeastward into the Upper Missouri Valley, and by the following morning was central in the Upper Mississippi Valley, accompanied by light to heavy snow; lowest barometer at North Platte and Omaha, 29.89 and 29.93, respectively. 7th, depression central in the Lower Lake region and rapidly filling up, attended by light snow and southwest to northwest winds. During the day the depression disappeared to the eastward off the Middle Atlantic coast, followed by a decidedly rapid advance of high pressure from the west and northwest. By morning of the 8th an area of 30.60 embraced the Middle Atlantic coast. No. VIII.—Following the rapid disappearance of area No.

VII, this depression appeared in the Saskatchewan Valley on the 7th and moved rapidly eastward over northern Montana and Dakota to Lake Superior, where it was central on the morning of the 8th, but with little energy. On this morning the barometer at Fort Garry read 30.50, while the area of low was inclosed by the isobar of 30.00. With slowly decreasing pressure at the center, the depression passed eastward to the Canadian maritime provinces, and on the morning of the 9th was inclosed by the isobar of 29.60; lowest barometer (29.42) at Chatham and Dalhousie, N. B. Passing eastward over Newfoundland during the day the depression was central over the ocean on the 10th in about 50° N., 40° W., with greatly increased energy. In 53° 58′ N., 27° 49′ W., 29.47, SW., force 5, high westerly sea; in 48° 57′ N., 38° 04′ W., 28.80, WSW., light winds, very heavy rain; in 49° N., 31° 40′ W., N. to SW., heavy gale, very high sea; in 48° N., 32° 22′ W., strong westerly gale, high sea and rain; in 50° 28′ N., 22° W., heavy gale, high sea. 11th, in 52° 54′ N., 29° 50′ W., 28.41, W., force 10, very heavy westerly sea; in 49° 53′ N., 29° 58′ W., 29.11 NW., force 3, heavy sea; in 50° N., 23° W., NE., strong gale, heavy seas continually breaking over vessel, five seamen disabled, wind finally backed to SW., with high cross-sea; decks swept; in 50° N., 21° W., WNW., hard gale, high sea. 12th, depression central off the northwestern coast of Iceland. The following observations were reported from Stykkisholm during the approach and passage of this depression. 10th, 29.10, E., force 6; 11th, 28.72, E., force 6; 12th, 28.36, SE., force 8, rain; 13th, 29.46, SW., force 7, snow. The following observations were reported from Godthaab during the approach and passage of this depression: 11th, 29.60, N., force 4; 12th, 29.46, NNW, force 5, snow. No. IX.—This depression began to enter the Northwest during the 8th and by the following morning was central in Dakota. 9th, Bismarck, 29.88, a fall of 0.52 inch, SW., clear; York Factory, 29.88, a fall of 0.20 inch, S., threatening. Between these two stations the pressures at Pembina and Fort Garry were 30.06 and 30.16 respectively, wind S., cloudy. 10th, depression central north of Lake Superior. Moose Factory, 29.79, a fall of 0.59 inch, SW., cloudy; Marquette, 29.90, a fall of 0.58 inch, W., clear; Escanba, 29.89, a fall of 0.62 inch, NW., cloudy; York Factory, 30.07, SW., snow; Fort Garry, 29.94, SW., clear; Duluth, 29.94, a fall of 0.53 inch, SW., clear. During the day the depression disappeared over northern Canada in a high-pressure area, 30.30. No. X.—This disturbance entered the North Pacific coast on the 10th and passed eastward over Washington Territory; Olympia, 29.65, a fall of 0.48 inch, SW., fair; Portland, Oreg., 29.78, a fall of 0.42 inch, SE., cloudy. Moving rapidly eastward during the day the depression became central in western Colorado on the 11th; lowest barometer at North Platte, 29.07, a fall of 0.76 inch, NW., fair; Cheyenne, 29.44, a fall of 0.46 inch, NW., clear; Dodge City, 29.14, a fall of 0.76 inch, SW., cloudy. On this day the isobar of 29.80 embraced almost the entire portion of the United States included within the meridians of 90° and 120° W.; snow with southwest to northwest winds prevailed in the Plateau regions and threatening or rainy weather with southerly winds in the Mississippi Valley. During the 11th the course of the depression changed from east to northeast as the area moved over the northern portions of the Upper Mississippi Valley and Upper Lake region. 12th, depression central north of Lake Superior. Moose Factory, 29.01, a fall of 1.06 inches, NE., snow; Marquette, 29.24, a fall of 0.65 inch, W., cloudy; Alpena, 29.20, a fall of 0.94 inch, SW., cloudy; Parry Sound, Ont., 29.24, a fall of 1.01 inches, S., cloudy; Rockliffe, Ont., 29.27, a fall of 1.06 inches, calm, light hail; Saugeen, Ont., 29.28, a fall of 0.95 inch, S., clear. The winds throughout the Upper Lake region shifted to west with increasing force and in the Lower Lake region, from southeast to southwest. The eastward movement of the area on the 12th cannot be clearly indicated owing to lack of reports from the country east of Hudson's Bay. On the 13th the depression was probably central near the entrance to Davis Straits. In the Lake region the winds had shifted to northerly with falling pressure owing to the advance northeastward over the Ohio Valley of area No. XI. In the Canadian maritime provinces the barometer fell decidedly with southerly winds, the isobar of 29.60 replacing that of 30.20 of the previous day. The following observations were reported from Godthaab during the approach and passage of the depression: 12th, 29.46, NNW., force 5, snowing; 13th, 29.20, NNE., force 6, cloudy; 14th, 29.20, NE., force 4, cloudy; 15th, 28.99, NNE., force 2, cloudy; 16th, 29.72, NW., force 4, cloudy; 17th, 29.71, NE., force 2, cloudy; 18th, 29.83, NW., force 3, snowing. The following observations were reported from Stykkisholm during the approach and passage of the depression: 13th, 29.46, SW., force 7, snowing; 14th, 28.82, SE., force 8, cloudy; 15th, 29.56, SE., force 6, cloudy; 16th, 29.57, E., force 2, clear; 17th, 29.54, NE., force 8, cloudy; 18th, 29.51, NE., force 8, snowing; 19th, 29.34, NE., force 8, fair; 20th, 29.50, NE., force 7, fair. From the 13th to 19th the winds over the British Isles remained steady from southwest to southeast and east with maximum wind velocities ranging from 24 to 53 miles. The barometer ranged as follows: 13th, 29.88 at North Unst to 30.37 at Helston; 14th, 29.24 at Monach Light-house to 30.02 at Helston; 15th, 28.87 at Valencia to 29.96 at Silloth Rectory; 16th, 28.43 at Roche's Point and 28.45 at Galway to 29.49 at North Unst; on.

this day the barometers at 30 stations fell below 29.00; 17th, 28.70 at Monach Light-house and Valencia to 29.40 at Helston; 18th, 28.85 at Galway and Monach Light-house to 29.65 at Helston; 19th, 28.34 at Monach Light-house to 29.59 at Helston; on this day the barometers at 15 stations fell below 29.00. The following reports from the logs of vessels indicate the influence of this severe storm: 15th, in 54° 27′ N., 19° 50′ W., 28.50, SSE., force 8, very high sea; in 49° 26′ N., 11° 57′ W., 28.82, SW., force 6, heavy sea; in 51° 20′ N., 30° 20′ W., hurricane from NW., with dangerous cross-sea, decks swept. 16th, in 53° 17′ N., 25° 11′ W., 28.30, ENE., force 6, heavy sea; St. George's Channel, England, 28.53, SE., force 8, stormy, heavy rain; in 49° 14′ N., 16° 02′ W., 28.77, NW., force 5, heavy sea, hailing; in 49° 40′ N., 13° 31′ W., SW., SE., and NW., very stormy; in about 52° N., 30° W., terrific hurricane from southeast to southwest with dangerous cross-sea; in 39° 20′ N., 59° W., violent hurricane from SW. to NW.; in 46° N., 36° 29′ W., violent SW., gale, heavy sea. 17th, in 42° 10′ N., 56° 40′ W., NNW., strong gale, violent squalls, very heavy sea; in about 48° 50′ N., 35° 20′ W., continuation of violent hurricanes since the 15th, several men washed overboard and drowned, vessel abandoned in a sinking condition; in 51° 08′ N., 32° W., 28.98, NNE., force 6, rough sea; in 44° 19′ N., 51° 09′ W., 29.55, NW., force 9, very heavy sea, snowing; in 49° 07′ N., 19° 31′ W., 28.65 WNW., force 6, heavy sea. 18th, in about 49° N., 30° W., wind veered to NNW., blowing a hard gale, with violent squalls of hail, high cross-sea, vessel ran to SSW., for thirty hours when gale moderated, barometer gradually rose from 28.80 to 30.14; in 45° N., 42° 26′ W., NNW., strong gale, heavy sea; in 45° N., 43° W., violent northerly gale, very high sea; in 41° 34′ N., 28° W., W., strong gale, heavy sea continuing all day; in 49° 10′ N., 39° 68′ W., 29.05, N., force 6, high sea, light rain; in 49° 02′ N., 22° 40′ W., 28.68, W., force 6, heavy sea, two hours of rain; in 48° 50′ N., 26° 52′ W., 29.16, W., force 5, cloudy. The peculiar movement of the depression from the 14th to the 19th was probably due to the very high pressures over central and northern Europe, which did not give way until the morning of the latter date. 13th, pressures ranged from 30.20 to 30.79, highest in southeastern Russia; 14th, from 30.15 to 30.62, highest in southeastern Russia; 15th, from 30.10 to 30.72, highest in northern Russia; 16th, from 30.00 to 30.87, highest in northwestern Russia; 17th, from 30.00 to 30.91, highest in northwestern Russia; 18th, from 30.00 to 30.77, highest in northwestern Russia; 19th, 30.00 to 30.69, highest in southern Russia. On this day (19th) the isobar of 29.80 ran continuously from 20° E., to 70° W., and generally embraced the region between the parallels of 40° and 70° N., the center of the depression being located over the Hebrides, barometer, at Monach Light-house, 28.34. Continuing the course of the area to the eastward, it was found to be central on the morning of the 20th north of Scotland; lowest barometer at North Unst, 28.75, S., cloudy; Monach Light-house, 28.96, NW., fair; Aberdeen, 28.93, SW., cloudy; Bolton, 29.10, SW., threatening; Thorshavn, 28.84, NE., cloudy; Bergen, 28.93, S., raining; Brono, 29.10, ESE., cloudy; Christiania, 29.14, NNE., snowing; Tromso, 29.31 SE., clear. Throughout Sweden the barometer ranged from 29.22 at Upsala to 29.61 at Haparanda, winds east to south. 21st, depression central in southern Sweden, with greatly diminished energy. Wisby, 29.32, W., cloudy; Stockholm, 29.35, NNE., cloudy; Upsala, 29.38, NNE., snowing; Dorpat, 29.40, a fall of 0.21 inch, ESE., snowing. 22d, depression central east of the Gulf of Finland. St. Petersburg, 29.70, a rise of 0.21 inch, NNE., fair; Dorpat, 29.77, a rise of 037 inch, NNW., fair; Moscow, 29.63, a fall of 0.29 inch, S., cloudy; Archangel, 29.48, a fall of 0.14 inch, SE., cloudy. During the day the depression moved eastward to central Russia, gradually filling up. 23d, Kasan, 29.85, S., snowing; Lugan, 29.78, SW., cloudy; Moscow, 29.79, N., cloudy; Archangel, 29.80, W., clear. During the day the course of the depression changed to the south, and on the following morning the area was central in about 40° N., 40° E. Lugan, 29.85, WSW., fair. Depression rapidly filling up, and by the morning of the 25th the isobar of 30.15 replaced that of 29.80 of the day before. No. XI.—As area No. X passed northeastward to the Upper Lake region on the 11th this depression developed over western Texas, probably through the influence of the warm southerly winds from the Western Gulf, which at that time prevailed throughout Texas and northward to Kansas. During the 12th the depression passed rapidly northeastward over the Western Gulf States, accompanied by southerly gales along the northern Gulf coast, and heavy rains throughout Arkansas, Tennessee, and the Ohio Valley. Violent local storms occurred in portions of Kentucky and Tennessee, causing considerable destruction to property. Lowest barometers were reported as follows: Coleman City, Tex., 29.42; Concho, Tex., 29.27; Dodge City, Kans., 29.48; Fort McKavett, Tex., 29.19; Fort Sill, Ind. T., 29.46. 13th, depression central in Kentucky; Nashville 29.52, a fall of 0.32 inch, S., heavy rain, 2.63 inches in past twenty-four hours; Cairo, 29.52, a fall of 0.31 inch, N., light rain; Knoxville, 29.60, a fall of 0.39 inch, SW., cloudy; Memphis, 29.50, a fall of 0.33 inch, E., cloudy, 3.05 inches rainfall in past twenty-four hours. On this day the central area was inclosed by the isobar of 29.60, which embraced a narrow barometric trough extending from Arkansas northeastward to southern New York. The isobar of 29.80 embraced almost the entire country east of the 90th meridian, and from the Atlantic coast it ran thence eastward just north of parallel 40° to the British Isles, and again northeastward to parallel 70° N., inclosing within this vast region three separate areas of low pressure, viz, Nos. X, XI, and XII. The heavy rains of the 12th and 13th caused dangerous freshets in the Ohio, Cumberland, and Tennessee Rivers, and considerable property was destroyed by floods. Moving rapidly northeastward over the Ohio Valley and Middle Atlantic States on the 13th, the depression became central on the following morning over the ocean southwest of Nova Scotia. Eastport, Me., 29.46, a fall of 0.19 inch, NE., light rain; Portland, Me., 29.42, a fall of 0.23 inch, NW., light rain; Yarmouth, N. S., 29.42, a fall of 0.31 inch, SE., foggy; Little Glace Bay, N. S., 29.62, NE., snowing; Halifax, N. S., 29.55, a fall of 0.13 inch, NE., light rain; Saint John, N. B., 29.62, NE., rain and hail. During the day the depression passed northeastward over the Canadian maritime provinces, followed by rapidly rising pressure, with winds shifting to northerly. The effect of the depression as it passed eastward over the ocean is indicated to some extent by the following reports: 14th, 44° N., 47° W., NW., strong gale, high sea; in 44° N., 46° W., NW. and W., strong gale, heavy westerly sea; in 47° N., 40° W., NNW., moderate gale, high confused sea. During the 15th the depression combined with area No. X then central in about 55° N., 35° W. No. XIII.—This disturbance entered the north Pacific coast on the 14th accompanied by light to heavy rains in Oregon and Washington Territory. Olympia, 29.81, a fall of 0.47 inch, SW., light rain, 2.46 inches in past twenty-four hours; Portland, Oreg., 30.02, a fall of 0.39 inch, SW., heavy rain; Umatilla, 29.99, a fall of 0.49 inch, W., cloudy. During the day the depression passed rapidly eastward along the northern boundary of the United States, accompanied by northerly winds and snow in the Saskatchewan Valley and southerly winds with cloudy and threatening weather in the northern Rocky Mountain region. 15th, depression central in northern Minnesota; Breckenridge, 29.52, a fall of 0.47 inch, W., fair; Duluth, 29.77, a fall of 0.09 inch, NW., cloudy; Saint Paul, 29.63, a fall of 0.21 inch; SE., fair; Pembina, 29.51, a fall of 0.36 inch, E., cloudy. During the day the depression rapidly filled up over the Upper Lake region and by the morning of the 16th had disappeared over northern Canada. No. XIV.—This depression entered the North Pacific coast on the 15th, following closely the disappearance to the eastward of area No. XIII. Olympia, 29.62, a fall of 0.19 inch, NW., light snow; Portland, Oreg., 29.66, a fall of 0.36 inch, calm, fair; Roseburgh, Oreg., 29.81, a fall of 0.51 inch, SW., light rain; Umatilla, 29.69, a fall of 0.30 inch, SE., light rain. During the day the depression passed rapidly eastward over the Plateau regions and by morning of the 16th was central in the Middle Slope. Cheyenne, 29.72, a fall of 0.10 inch SW., clear; North Platte, 29.19, a fall of 0.47 inch, S., fair; Denver, 29.55, a fall of 0.33, inch, NW., clear; Dodge City, 29.39, a fall of 0.46 inch, S., fair. Very little precipitation attended the area on this day, either preceding or following its northerly movment. For the twenty-four hours ending morning of the 17th, only fifteen stations throughout the United States reported even the slightest precipitation, the amounts ranging from trace to 0.34 inch. 17th, depression central with greatly diminished energy in northern Wisconsin, inclosed by the isobar of 29.80, which extended southwestward from Lake Superior to the Rio Grande Valley. Along the western limit of this area the winds were west and northwest with clear or partly cloudy weather, and along the eastern limit, southerly with generally cloudy weather. 18th, depression central over the Province of Ontario, inclosed by the isobar of 29.80. Parry Sound, 29.66, a fall of 0.44 inch, W., light rain; Stratford, 29.77, a fall of 0.37 inch, SW., heavy rain; Granton, 29.76, a fall of 0.37 inch, calm, raining. Port Stanley, 29.82, a fall of 0.37 inch, W., light rain. 19th, depression central over the Gulf of Saint Lawrence, followed over the Lower Lakes and in the Middle Atlantic States by rapidly rising pressure and northwesterly winds with light to heavy snow in the former. Dalhousie, N. B., 29.40, a fall of 0.77 inch, W., clear; Charlottetown, P. E. Island, 29.44, a fall of 0.81 inch, SW., cloudy; Bathurst, N. B., 29.39, a fall of 0.72 inch, NW., fair. 20th, depression central off the Banks of Newfoundland. Saint Johns, Newfoundland, 29.57, a fall of 0.52 inch, W., fair; in 44° 11′ N., 62° 24′ W., 29.79, WNW., force 6, cloudy; in 45° 30′ N., 52° 30′ W., 29.70, W., force 6, snowing. 21st, depression central in about 55° N., 35° W., inclosed by the isobar of 29.80. It is rather difficult to locate the position of the central area on this date, owing to the lack of sufficient reports and the peculiar disposition of the surrounding depressions; area No. X over southern Scandinavia and the North Sea and area No. XVII central over Baffin's Bay. During the 21st the area No. XIV probably combined with No. XVII, the latter then central west of Iceland. No. XV.—This disturbance entered the North Pacific Coast region on the 18th, the isobar of 29.60 replacing that of 30.20 of the previous day. Light rain with southerly winds accompanied the depression, extending as far south as central California. As the depression passed to the eastward during the day, light snow with westerly winds followed its departure in the Middle and Northern Plateau regions. 19th, depression central in Montana; Virginia City, 29.51, a fall of 0.14 inch, calm, cloudy. 20th, central in northern Dakota; Fort Buford, 29.79, a fall of 0.40 inch, NW., clear; Pembina, 29.70, a fall of 1.07 inches, S. cloudy; Breckenridge, 29.86, a fall of 1.00 inch, S., clear; Fort Garry, 29.71, a fall of 1.16 inches, S. W., clear. The central area was inclosed by the isobar of 29.80, which extended southwestward from Manitoba to New Mexico. The progress of the area on the 19th and 20th was necessarily very slow, owing to the extremely high pressures which prevailed in the Northwest and Upper Mississippi Valley, ranging from 30.60 to 30.86. 21st, depression central over the Province of Ontario, the isobar of 29.60 replacing that of 30.60 of the previous day; Parry Sound, 29.49, a fall of 1.18 inches, SW., light snow; Saugeen, 29.54, a fall of 1.08 inches, W., snowing; Rockliffe, 29.53, a fall of 1.07 inches, NW., cloudy; Montreal, 29.67, a fall of 0.85 inch, S., cloudy; Buffalo, 29.58, a fall of 1.08 inches, SW., heavy snow. Light to heavy snow was reported from 12 Canadian and 8 Signal Service stations within the central depression. Since the 19th the storm has rapidly increased in energy, and now extends its influence to the Atlantic coast, having entirely displaced the high area which first obstructed its translation to the eastward. During the 21st the depression changed its course more to the north, and moved northeastward over the Province of Quebec and the Labrador Peninsula. Leaving the Labrador coast on the 22d, the depression crossed Davis Straits and was probably central off the western coast of southern Greenland by morning of the 23d; Godthaab, 28.86, a fall of 0.51 inch, S., cloudy. During the day the depression passed rapidly over southern Greenland, and by the following morning was central north of Iceland; Godthaab, 29.77, a rise of 0.91 inch, NW., snowing; Stykkisholm, 29.59, a fall of 0.30 inch, SW., snowing. 25th, depression central in about 67° N., 00° W., Godthaab, 29.89, S., force 6, snowing; Stykkisholm, 29.33, a fall of 0.26 inch, W., cloudy; Thorshavn, 29.32, a fall of 0.50 inch, W., cloudy; North Unst, 29.54, a fall of 0.47 inch, WNW., cloudy; Bergen, 29.67, a fall of 0.46 inch, SW., 26 miles per hour, raining; Brono, 29.24, a fall of 0.56 inch, SE., 18 miles, raining; Tromso, 28.99, a fall of 0.60 inch, SSE., cloudy. On this day the isobar of 29.80 embraced the entire region north of 60° N., between the meridians of 60° E. and 40° W. The area of precipitation embraced the British Isles, Scandinavia, and portions of northwestern Russia, with southwesterly winds, increasing to gales along the various coasts. 26th, depression central in northern Sweden, inclosed by the isobar of 28.60. On this day the isobar of 29.20 embraced the whole of Scandinavia and northwestern Russia. Hernosand, 28.59, a fall of 0.88 inch, S., cloudy; Umea, 28.64, a fall of 0.69 inch, SW., cloudy; Christiania, 28.65, a fall of 1.03 inches, SW., cloudy; Tromso, 28.74, a fall of 0.25 inch, NNW., cloudy; Haparanda, 28.71, a fall of 0.42 inch, S., snowing. 27th, depression central over Finland and slowly filling up; central area inclosed within the isobar of 28.80. Archangel, 28.96, a fall of 0.04 inch, SE., cloudy; Dorpat, 28.58, a fall of 0.72 inch, SSW., snowing; St. Petersburg, 28.73, a fall of 0.49 inch, SSE., light snow; Haparanda, 28.63, a fall of 0.08 inch, N., cloudy. Along the western coast of the Baltic and the Gulf of Bothnia the winds shifted to northwesterly, with increased force and slowly rising pressure; throughout Russia the winds were from southeast to southwest. 28th, depression central in northeastern Russia, and rapidly filling up. Kasan, 29.53, a fall of 0.34 inch, S., snowing; Ekaterinburg, 29.64, a fall of 0.50 inch, SW., snowing. During the day the depression disappeared in a high pressure area over western Siberia. No. XVI.—Closely following area No. XV this depression entered the Northwest from the Saskatchewan Valley on the 21st; Fort Buford, 29.63, a fall of 0.16 inch, SW., clear; Bismarck, 29.79, a fall of 0.09 inch, SW., clear. 22d, depression central in northern Michigan, but with slight energy; lowest barometer at Escanaba, 29.70, a fall of 0.10 inch, wind NW., clear. No precipitation has attended the area since its incipiency. 23d, depression central in the western portion of the Middle Atlantic States, followed in the Lower Lakes and Canada by northwesterly winds, with snow. Albany, 29.56, a fall of 0.40 inch, S., light snow; Burlington, 29.48, a fall of 0.42 inch, SW., cloudy; New York, 29.60, a fall of 0.40 inch, W., light rain. During the day the depression passed southeastward off the New England coast, followed over the Middle Atlantic States and in southern New England by northwesterly winds, clear weather and rapidly rising pressure. In northern New England and the Canadian maritime provinces, northeasterly winds with snow prevailed. 24th, depression central south of Nova Scotia; Halifax, 29.77, a fall of 0.08 inch, wind shifted from SSE. to NE., cloudy; in 40° 34′ N., 69° W., NW., hard gale, very high sea. During the day the depression moved slowly to the northeast, its more rapid progress being hindered by a large area of high pressure northwest of the Azores, within which the barometer ranged from 30.20 to 30.73. 25th, in 43° 10′ N., 56° 30′ W., 29.83, E., force 6, foggy; in 41° 30′ N., 66° 20′ W., 29.99, N., force 6, fair. During the 25th the high-pressure area northwest of the Azores remained about stationary, forcing the depression to change its course to almost due north, passing thence over Newfoundland and becoming central on the 26th south of Greenland; Godthaab, 29.87, a fall of 0.02 inch, wind shifted from S., force 6, snowing, to N., force 2, cloudy. 27th, depression central, with increased energy south of Iceland; Godthaab, 29.86, NE., force 2, fair; Stykkisholm, 28.88, a fall of 1.07 inches, NW., force 6, cloudy; Thorshavn, 28.98, a fall of 0.56 inch, SW., force 7, cloudy; North Unst, 29.36, a fall of 0.05 inch, W., force 6, cloudy; the low reading of the barometer at this station was probably as much due to the influence of area No. XV as to the present disturbance. 28th, depression central off the western coast of Norway; lowest barometer at Brono, 29.37, a fall of 0.64 inch, ENE., 36 miles per hour, cloudy. Throughout Scandinavia the pressure at all stations was below 29.00, and snow, with southwest to northwest winds prevailed. In rear of the depression the winds along the coast and over the ocean shifted to northwesterly with great force, reaching a velocity of over 70 miles per hour at Thorshavn. In Denmark, northern Germany, and along the southern shores of the Baltic southwest winds prevailed with velocities ranging from 25 to 75 miles per hour accompanied by rain and snow. The pressure over this region had hardly recovered from the passage of area No. XV and therefore the changes were rather inconsiderable except at a few stations. 29th, depression central in Finland, where but two days previous area No. XV occupied a similar position. The isobar of 29.60 embraced the whole of Europe north of 50° N., and extended westward to 40° W. The central area was enclosed by the isobar of 28.60, which embraced all territory north of 60° N., and between the meridians of 10° and 40° E. Umea, 28.51, a fall of 0.20 inch, NNW., force 6, cloudy; Haparanda, 28.53, a fall of 0.11 inch, N., cloudy; Brono, 28.53 a rise of 0.16 inch, E., fair; Hernosand, 28.56, a fall of 0.04 inch, NW., fair; Tromso, 28.52, a fall of 0.19 inch, SW., clear; Archangel, 28.69, a fall of 0.15 inch, ESE., cloudy; St. Petersburg, 28.61, a fall of 0.45 inch, W., cloudy; Dorpat, 28.85, a fall of 0.27 inch, WSW., light snow; Moscow, 29.10, a fall of 0.25 inch, S., cloudy; Wilna, 29.23, a fall of 0.20 inch, SSW., threatening. Along the southern and western shores of the Baltic, in northern Germany, Northern France, and in the British Isles, southwesterly winds with velocities ranging from 20 to 70 miles per hour prevailed, accompanied by rainy or threatening weather, with occasionally heavy snow in northern Germany. A continuation of the course of this area will appear on Chart No. V, for March, 1880. No. XVIII.—This depression appeared suddenly over Davis Straits, north of parallel 60° N. on the 21st, and probably crossed over from the region north of Hudson's Bay. Godthaab, 28.81, a fall of 0.18 inch, S., force 4, cloudy. 22d, depression central northwest of Iceland. Godthaab, 29.37, a rise of 0.56 inch, S., force 6, snowing; Stykkisholm, 29.61, a fall of 0.23 inch, S., force 2, raining. 23d, depression central northeast of Iceland. Stykkisholm, 29.89, a rise of 0.28 inch, SW., cloudy; Thorshavn, 29.90, a fall of 0.25 inch, calm, cloudy; Tromso, 29.38, a fall of 0.34 inch, SW., 36 miles per hour, cloudy; Brono, 29.89, a fall of 0.07 inch, SW., 18 miles, cloudy; Haparanda, 29.89, a rise of 0.15 inch, SW., clear. 24th, depression central east of the White Sea and rapidly filling up; lowest barometer at Archangel, 29.59, a fall of 0.21 inch, WSW., 18 miles per hour, fair. During the day the depression disappeared over northwestern Siberia. No. XVIII.—Like most of its predecessors this depression moved rapidly northeastward from the Saskatchewan Valley, following closely the disappearance of the previous low area. 23d, central north of Montana, inclosed by the isobar of 29.80. During the day the depression moved eastward into Manitoba, and by the morning of the 24th was central in northern Minnesota, inclosed by the isobar of 29.40; Fort Garry, 29.48, a fall of 0.40 inch, N., cloudy; Pembina, 29.24, a fall of 0.46 inch, calm, fair; Breckenridge, 29.30, a fall of 0.58 inch, SE., cloudy; Saint Paul, 29.43, a fall of 0.58 inch, SE., cloudy; Duluth, 29.48, a fall of 0.55 inch, calm, fair. 25th, depression central in the southern portion of the Upper Lake region; lowest barometer at Escanaba, 29.30, a fall of 0.36 inch, NW., foggy; Milwaukee, 29.33, a fall of 0.43 inch, SW., cloudy; Grand Haven, 29.38, a fall of 0.49 inch, SE., light rain. Southerly winds with rain prevailed throughout the Ohio Valley, Lower Lakes, and in the Province of Ontario. During the day the depression passed eastward with diminishing pressure down the valley of the Saint Lawrence, and on the following day combined with area No. XVI off the coast of Labrador. No. XIX.—While the previous area was central near the Upper Lake region, on the 24th, this depression descended from the Saskatchewan Valley, and on the following morning was central in the Northern Rocky Mountain Slope; lowest barometer at North Platte, 29.34, a rise of 0.07 inch, NW., clear; Denver, 29.66, no change, W., clear; Cheyenne, 29.55, a fall of 0.10 inch, W., clear. The pressure in this region had not recovered from the influence of the recent passage of area No. XVIII, consequently the small changes noted. During the day the depression moved very slowly eastward, with slightly increasing energy, and by the following morning was central in the Upper Mississippi Valley. Owing to the rapid advance of a high-pressure area from the region north of Lake Superior, the depression on the two succeeding days was prevented from moving in the usual course to the eastward, and consequently a curved condition of the track is indicated upon the chart. In more concise terms, the depression remained about stationary during most of the 26th and 27th. On the 28th depression central south of Lake Michigan, inclosed by the isobar of 29.80. Chicago, 29.70, a fall of 0.30 inch, N., cloudy; Milwaukee, 29.91, a fall of 0.06 inch, NE., light rain; northeast to northwest winds with rain and snow prevailed throughout the Upper Lake region and Upper Mississippi Valley, and southerly winds with cloudy weather in the Ohio Valley and Lower Lake region. 29th, depression central in the Province of Quebec. Cornwall, 29.32, a fall of 0.64 inch, W., clear; Montreal, 29.33, a fall of 0.55 inch, SE., cloudy; Rockliffe, 29.26, a fall of 0.75 inch, E., threatening; Quebec, 29.40, a fall of 0.81 inch, E., sleeting. The area of precipitation extended eastward to Nova Scotia with southeasterly winds. During the day the depression passed eastward over the Canadian maritime provinces and on the following morning was probably central off the Nova Scotia coast. The continuation of this area will appear upon Chart No. V for March, 1880. No. XX.—This depression appeared on the 28th over the ocean, west of British Columbia, and by the morning of the 29th had entered that territory, the isobar of 29.80 replacing that of 30.40 of the previous day. Rain and snow with southerly winds prevailed in Oregon and Washington Territory, and with easterly winds in the Northern Plateau region; Olympia, 29.74, a fall of 0.50 inch, S., light snow; Portland, Oreg., 29.98, a fall of 0.40 inch, SE., cloudy. The continuation of this area will appear upon Chart No. V for March, 1880. Of those areas charted as coming directly from the ocean, the following descriptions are given: No. IV.—This depression appeared on the 1st over northern Scandinavia as a continuation of area No. XXII, of Chart No. V for January, 1880. 1st, Tromso, 28.84, a fall of 0.17 inch, SW., 29 miles per hour, rain and snow; Haparanda, 29.30, a fall of 0.25 inch, SW., force 6, cloudy; Archangel, 29.17, a fall of 0.31 inch, WSW., 22 miles per hour, cloudy. During the day the depression passed rapidly southeastward over the White Sea, and on the 2d was central in western Siberia; Ekaterinburg, 29.16, a fall of 0.38 inch, WSW., 27 miles per hour, cloudy; Kasan, 29.58, a fall of 0.22 inch, WSW., cloudy. 3d, depression central in the valley of the Obi; Ekaterinburg, 29.52, a fall of 0.36 inch, NW., cloudy; Barnaul, 29.58, a fall of 0.25 inch, SW., 45 miles per hour, cloudy; Yeniseisk, 29.26, a fall of 0.67 inch, E., 13 miles, snowing. During the 4th the depression disappeared in a high pressure area, 30.40 over central Siberia. No. V.—While area No. III was central west of Iceland on the 3d, this depression suddenly disappeared off the northwestern coast of Norway; Tromso, 28.68, a fall of 0.70 inch, SW., raining; Brono, 29.26, a fall of 0.41 inch, SW., 45 miles per hour, raining; Haparanda, 29.27, a fall of 0.34 inch, SW., force 4, raining. 4th, depression central southeast of the White Sea; Archangel, 29.21, a fall of 0.28 inch, WNW., 18 miles per hour, cloudy; Kasan, 29.14, a fall of 0.59 inch W., 13 miles, light snow; Ekaterinburg, 29.30, a fall of 0.22 inch, S., cloudy. 5th, depression central east of the Ural Mountains; Ekaterinburg, 29.28, NW., cloudy; Barnaul, 29.93, a rise of 0.02 inch, SW., fair; Yeniseisk, 29.99, a rise of 0.24 inch, wind shifted from SW. to E., clear. 6th, depression probably central between the Obi and Yenisei Rivers. As area No. III appeared central in northern Russia on this date and in about the same latitude, an elongated area of barometric minima (29.40) formed in connection with the two depressions and ran eastward, north of 50° N., between the meridians of 30° and 90° E., with the lowest pressure at Ekaterinburg, 29.32, a rise of 0.04 inch, WSW., 13 miles per hour, cloudy; Barnaul, 29.48, a fall of 0.45 inch, SW., 45 miles per hour, cloudy; Yeniseisk, 29.57, a fall of 0.42 inch, S., cloudy; by morning of the 7th the depression had passed east of the Yenisei and during the day disappeared over central Siberia under the influence of a high pressure area, 30.60. No. XII.—After the passage of area No. VIII northeastward north of parallel 50° N. on the 10th, the influence of its energy still remained, and was effective in developing in the vicinity of 40° N., 35° W., another storm of great severity. The following reports from logs of vessels indicate the violent effects of an attempted restoration of atmospheric equilibrium in rear of advancing area No. VIII and which were instrumental in forming area No. XII: 10th, in 42° N., 55° W., WSW., NW., and NNW., violent gales with squalls of rain, very heavy sea; in 42° N., 57° W., W. to NW., hard gale with high confused sea; in 42° 31′ N., 54° 31′ W., NW., heavy storm with squalls of rain; in 48° 15′ N., 49° 10′ W., NNW. gale with thick snow, encountered large fields of drifting ice and icebergs between 46° 54′ N. and 48° 15′ W., in 41° 30′ N., 41° 30′ W., heavy westerly gales, high sea. 11th, in 45° N., 46° W., NW. to NNW., violent to moderate gales, rain and snow squalls, high confused sea; in about 45° N., 35° W., terrific westerly gale with high cross sea, which at times burst into the saloon, one man washed overboard, steamer made only 80 miles in over twenty-four hours; in 48° 24′ N., 33° 13′ W., NW., terrific gale, very high sea; in 47° 13′ N., 34° W., SW. and WNW. hurricane, changing the gale from SW. to NW. with tremendous high sea. On the 12th the depression was probably central north of the Azores, the winds at Angra and Ponta Delgado shifted from W. to S., with falling barometer. In 47° N., 38° W., SE. to NW., fresh gale, high head sea; in 46° 33′ N., 39° W., SW. to NW., violent gale, with "frightful" sea; in 49° 34′ N., 28° 44′ W., NW., strong gale, hard squalls, high sea; in 49° 19′ N., 21° 50′ W., W. to N., hard gale, very high sea; in 44° N., 23° W., hurricane from SSE., vessel thrown on beams end; in 42° 35′ N., 35° 55′ W., "terrible" gale from SW. to W., lasting eighteen hours; in 43° 02′ N., 34° 22′ W., strong gale veering from SW. to NW., with high seas, 7 p. m. terrific gale from W., very high sea, smashing boats and clearing decks, four seamen lost and vessel thrown on beams end. 13th, depression central in about 50° N., 20° W. In 50° 15′ N., 17° 38′ W., 28.86, SSW., moderate gale, heavy rain; in 51° 26′ N., 34° 50′ W., 29.43, NNW., force 9, heavy northerly sea; in 46° 10′ N., 43° W., ESE. to NW., heavy gale, high head sea; in 44° 39′ N., 43° 48′ W., E. to N. with hurricane force, ship on beams end, squalls of rain and snow with a "frightful" sea; in 48° 40′ N., 34° 38′ W., SE. and variable, strong gale, high confused sea; in 50° 06′ N., 13° W., southwest hurricane with tremendous sea, 3 a. m., heavy sea swept decks, noon, wind shifted to WNW., and blew with great violence until midnight, when it changed to WSW., with heavy squalls of rain; in 49° N., 25° W., barometer 28.10, violent gale from SW., wind suddenly changed to WNW. in a most violent squall and blew a perfect hurricane, 3 p. m., tremendous westerly sea, 5 p. m., heavy cross sea sweeping decks; in 45° N., 23° W., terrific gale from SW.; in 43° N., 28° W., hurricane from NW., lasting forty-eight hours; in 42° N., 30° W., "hurricane from SE. all around the compass by W., lasting twenty-four hours." 14th, depression moved slowly northward and during the day combined with area No. X, then central south of Iceland. In 47° 57′ N., 28° W., NW., violent gale, terrific squalls, heavy sea; in 51° N., 13° 33′ W., S. and W., strong gale, high sea; in 50° N., 22° 40′ W., SE., SW., and NW., strong gale, very high confused sea. The continuation of this severe storm is fully considered under the head of area No. X, with which, after the 14th, it became identified and together proved the most violent and extensive atmospheric disturbance of the month.

TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of January, 1882, is exhibited by lines of equal thermometric mean values upon Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the averages for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. The temperature is everywhere above the normal, except in New England and west of the 110th meridian. The single large area of excess covers the central portion of the country, where the departures range from 1°.2 in the Middle Atlantic States to 5°.6 in the Missouri Valley. The largest area of deficiency embraces the extreme western portion of the United States, where the departures range from 1°.0 in the Southern Plateau to 4°.6 in the Middle Plateau. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1873, together with the corresponding districts: 1874, +6°.9 Ohio Valley and Tennessee, +6°.6 Middle Atlantic States, and +6°.2 Lower Lake region; 1875, —13°.1 Minnesota and —11°.6 Upper Mississippi Valley; 1876, +9°.0 Ohio Valley and Tennessee and +7°.7 Upper Mississippi Valley; 1877, —5°.4 Middle Atlantic States and —5°.8 Lower Lake region; 1878, +13°.3 Minnesota and +12°.3 Upper Mississippi Valley; 1879, —2°.8 Middle Atlantic States and —2°.6 Lower Lake region; 1880, +15°.5 Upper Mississippi Valley, +14°.8 Ohio Valley and Tennessee, and +13°.3 South Atlantic and West Gulf States; 1881, —9°.8 Missouri Valley and —8°.9 Southeast Rocky Mountain Slope.

Deviations from mean temperatures.—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of Chart No. II. The following items of importance in connection with this subject are reported by voluntary observers: *Connecticut:* Southington, mean temperature, 24°.3, or 1° above the mean for the past eleven years. *Illinois:* Riley, mean temperature, 20°.6, or 2°.1 above the mean for past nineteen years. *Indiana:* Vevay, mean temperature considerably above the average for the month. *Kansas:* Yates Centre, mean temperature, 30°.5, or 4°.4 above the average for the past two years. Lawrence, mean temperature 32°.68, or 5°.56 above the average for the past fourteen years. Manhattan, mean temperature 31°.67, or 6°.82 above the average for past twenty-two years; five Januarys during this period have been warmer, viz: 1859, 1863, 1876, 1878, and 1880; the coldest January during the past twenty-two years occurred in 1875, mean temperature 15°.07. *Iowa:* Clinton, mean temperature considerably above the average. *Maine:* Gardiner, mean temperature 15°.75, or 2°.12 below the average for the past forty-six years. *Maryland:* Fallston, mean temperature 30°.30, or 0°.31 below the average for the past eleven years; during that period the highest January mean, 40°.13, occurred in 1880, and the lowest, 25°.05, occurred in 1881. *Michigan:* Thornville, mean temperature 26°.0, or 4°.0 above the average for several years. *Missouri:* Saint Louis, Missouri Weather Service reports, mean temperature slightly above the average for the past forty-five years. *New Hampshire:* Contoocookville, mean temperature 20°.5, or about 1°.0 below the average for the past twelve years. *New York:* Palermo, mean temperature 20°.3, or 0°.8 below the average for the past twenty-nine years; warmest January during that period occurred in 1880, mean temperature 29°.4, and the coldest, 12°.8, occurred in 1881; the lowest temperature recorded during that period was —31° in January, 1857. North Volney, mean temperature 22°.29, or 0°.48 below the average for the past fourteen years; warmest January during that period occurred in 1880, mean temperature 31°.82; coldest January occurred in 1881, mean temperature 15°.13; the lowest temperature recorded during the past fourteen years was—19°, January 23, 1871. *Ohio:* North Lewisburgh, mean temperature 29°.40, or 1°.03 above the mean for the past fifty-one years. *Vermont:* Woodstock, mean temperature 16°.4, or about 1° above the average for the past fifteen years; highest January mean during that period, 23°.8, occurred in 1880; lowest, 5°.8, occurred in 1875. *West Virginia:* Helvetia, mean temperature 35°.6, or 2°.29 above the average for the past six years; Wytheville, mean temperature 36°.4, or 0°.8 above the average for the past seventeen years.

Table of maximum and minimum temperatures for January, 1882.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Montgomery	79	24			
Arizona	Tucson	80				
Do	Prescott		—8			
Arkansas	Little Rock	70	24	Mount Ida	65	15
California	Campo	76	7	Fort Yuma	80	
Do				Summit		1
Colorado	Denver	67	1			
Do	Pike's Peak	26	—22			
Connecticut	New Haven	51	—12	Southington	53	—14
Dakota	Rapid City	56		Fort Randall	57	
Do	Fort Stevenson		—32	Fort Pembina		—40
Delaware	Delaware Breakwater.	56	10			
District of Columbia	Washington	59	8			
Florida	Key West	82		Fort Brook Tampa	84	
Do	Jacksonville and Pensacola.		32	Fort Barrancas		22
Georgia	Savannah	77		Thornville	77	24
Do	Augusta		22			
Idaho	Lewiston	51				
Do	Eagle Rock		—30			
Illinois	Cairo	64		Swanwick and Upper Alton.	67	
Do	Chicago		1	Elmira and Morrison.		—7
Indiana	Indianapolis	61	7	Vevay	65	
Do				La Fayette		1
Indian Territory	Fort Gibson	74				
Do	Fort Supply		—6			
Iowa	Keokuk	60		Cresco		—17
Do	Dubuque		—5			
Kansas	Dodge City	67	0	Fort Scott	70	
Do				Fort Wallace		—15
Kentucky	Louisville	65	16	Bowling Green	65	18
Louisiana	New Orleans	77				
Do	Shreveport		30			
Maine	Eastport	43	—14	Gardiner		—27
Do	Portland					
Maryland	Baltimore	59	7	Federalsburgh	61	
Do				Deer Park		—8
Massachusetts	Boston	53	—13	Heath	60	
Do				South Lee		—24
Michigan	Detroit	56		Fort Brady		—34
Do	Alpena		—27			
Minnesota	Duluth	47				
Do	Saint Vincent		—42			
Mississippi	Vicksburgh		30	Fayette	75	28
Missouri	Saint Louis	55		Protem	72	
Do	Springfield	58	6	Oregon		—4
Montana	Fort Custer			Fort Keogh	50	—37
Do	Terry's Landing		—36			
Nebraska	North Platte		— 8			
Nevada	Pioche			Golconda	74	
Do	Winnemucca		—4	Halleck		—34

Table of maximum and minimum temperatures for January, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
New Hampshire	Mount Washington	34	—39	Contoocookville	46	
Do				Grafton		—22
New Jersey	Atlantic City	59		Vineland	62	
Do	Barnegat		—1	South Orange		—4
New Mexico	La Mesilla	72		Fort Union		—11
Do	Santa Fé		7			
New York	Rochester	53		Fort Niagara	56	
Do	Albany		—14	Cooperstown and Johnstown.		—27
North Carolina	Wilmington	73		Weldon		5
Do	Charlotte		16			
Ohio	Cincinnati	63		Portsmouth	67	
Do	Cleveland		2	Hudson		0
Oregon	Portland	55				
Do	Umatilla		4			
Pennsylvania	Pittsburgh	61		Milton	57	
Do	Erie		—2	Blooming Grove		—19
Rhode Island	Newport	50	—8			
South Carolina	Charleston	76	26	Aiken		21
Tennessee	Memphis	71		Ashwood		16
Do	Knoxville		18			
Texas	Edinburgh	84		Fort Ringgold	86	
Do	Fort Elliott		4			
Utah	Salt Lake City	47	0	Coalville		—25
Vermont	Burlington	49	—25	Woodstock	50	
Do				Lunenburgh		—29
Virginia	Norfolk	66				
Do	Chincoteague		8			
Washington Territory	Almota	55				
Do	Colfax		—8			
West Virginia	Morgantown	64	9	Flemington		8
Wisconsin	Milwaukee	52		Embarrass		
Do	La Crosse		—11	Neillsville		—20
Wyoming	Cheyenne	60	—12	Fort Bridger		—22

Ranges of temperature at Signal Service stations.—Monthly ranges in general varied from 40° to 60° over the country east of the Rocky Mountains, and from 45° to 70° westward to the Pacific. The smallest ranges are: San Francisco, 21°; Key West, 25°; Portland, Oreg., 29°; San Diego, 30°; Port Eads, 31°; Red Bluff and New Orleans, 33°; Olympia, 35°; Hatteras, 36°; Galveston and Punta Rassa, 38°. The largest are: New Chicago, Mont., 90°; Terry's Landing, Mont., 88°; Fort Benton, 87°; Smithville, Dak., Fort Shaw, Mont., and Prescott, Ariz., 79°; Fort Custer, 77°; Camp Supply, Ind. T., 76°; Burlington, Vt., Fort Assinniboine, Mont., and Saint Vincent, 74°; Mount Washington and Fort Missoula, 73°; Rapid City, Dak., Fort Buford and Cheyenne, 72°; Duluth, 71°; Fort Elliott, Tex., 70°. The daily ranges varied in the different districts as follows: New England, 26° at New Shoreham to 37° at Eastport and 47° on the summit of Mount Washington; Middle Atlantic States, 21° at Lynchburgh to 34° at Albany and Barnegat and 37° at Chincoteague; South Atlantic States, 23° at Charleston to 29° at Atlanta and 32° at Portsmouth; Florida Peninsula, 13° at Key West to 19° at Cedar Keys and 21° at Punta Rassa; Eastern Gulf States, 23° at Mobile, 24° at New Orleans and 28° at Montgomery; Western Gulf States, 28° at Port Eads to 30° at Indianola and 41° at Denison and Fort Gibson; Rio Grande Valley, 26° at Brownsville to 32° at Eagle Pass and 35° at Castroville; Ohio Valley and Tennessee, 21° at Columbus to 29° at Pittsburgh and 34° at Indianapolis; Lower Lake region, 24° at Detroit and Toledo to 29° at Buffalo and 34° at Oswego; Upper Lake region, 23° at Grand Haven to 37° at Duluth and 41° at Alpena; Extreme Northwest, 41° at Saint Vincent to 44° at Fort Buford and 53° at Bismarck; Upper Mississippi Valley, 30° at Keokuk to 39° at Saint Paul and 42° at Saint Louis; Missouri Valley, 27° at Leavenworth to 44° at Yankton and 50° at Huron; Northern Slope, 36° at Cheyenne to 40° at Deadwood and 50° at Fort Custer; Middle Slope, 41° at Dodge City to 44° at Denver and 48° at Fort Elliott; Southern Slope, 34° at Fort Davis to 40° at Henrietta and 45° at Concho; Northern Plateau, 23° at Umatilla to 32° at Missoula and 35° at Eagle Rock; Middle Plateau, 21° at Salt Lake City to 28° at Pioche and 40° at Winnemucca; Southern Plateau, 34° at Santa Fé to 46° at La Mesilla and 48° at Prescott; Northern Pacific coast, 16° at Roseburgh to 17° at Portland and 21° at Olympia; Middle Pacific coast, 11° at San Francisco to 21° at Sacramento and 31° at Red Bluff; South Pacific coast, 28° at Los Angeles to 32° at Visalia and 48° at Campo.

Table of comparative minimum temperatures for the month of January, 1882.

State or Territory.	Minimum for January, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°			°		*Years.*
Alabama	Montgomery	24	Montgomery	14	1879	Huntsville	— 9	1832,'36	9
Arizona	Prescott	— 8	Prescott	—17	1880	Fort Canby	—20	1855	12
Arkansas	Little Rock	24	Little Rock	18	1881	Mount Ida	—10	1878	6
California	Campo	7	Campo	0	1880	Fort Crook	—20	1859	11
Do						Fort Bidwell	—18	1868	19
Colorado	Pike's Peak	—22	Pike's Peak	—33	1879	Fort Garland	—40	1873	29
Do	Denver	1				Fort Lyon	—28	1875	21
Connecticut	New Haven	—12	New Haven	— 5	1881	Colebrook	—25	1861	9
Dakota	Fort Stevenson	—32	Pembina	—53	1877	Fort Randall	—44	1875	22
Delaware	Delaware Breakwater	10	Delaware Breakwater	12	1881	Fort Delaware	— 5	1866	44
Do						Dover	0	1875	6
District of Columbia	Washington	8	Washington	—14	1881	Washington	—14	1835	48
Florida	Jacksonville and Pensacola.	32	Saint Marks	18	1879	Fort Barrancas	10	1852	60
Georgia	Augusta	22	Atlanta	9	1879	Atlanta	3	1873	8
Do						Augusta Arsenal	8	1835?	48
Idaho	Eagle Rock	—30	Eagle Rock	—25	1881	Fort Lapwai	—32	1875	18
Illinois	Chicago	1	Champaign	—15	1881	Rock Island Arsenal	—29	1873	14
Do						Galesburgh	—29	1864	8
Indiana	Indianapolis	7	Indianapolis	—22	1879	Arlington	—25	1879	2
Indian Territory	Fort Supply	— 6	Fort Supply	—17	1881	Fort Gibson	—20	1857	54
Iowa	Dubuque	— 5	Dubuque	—25	1881	Fort Madison	—33	1864	22
Kansas	Dodge City	0	Leavenworth	—20	1875	Fort Leavenworth	—30	1834	51
Kentucky	Louisville	16	Louisville	—10	'75, '79	Newport Barracks	—15		28
Louisiana	Shreveport	30	Shreveport	6	1879	Baton Rouge	8	1852	52
Maine	Eastport	—14	Eastport	—15	1878	Brunswick	—32	1859	52
Do						Gardiner	—31	1844	46
Maryland	Baltimore	7	Baltimore	— 6	1881	Fort McHenry	—15	1873	52
Massachusetts	Boston	—13	Springfield	—14	1881	Williamstown	—30	1835	55
Do						Lunenburgh	—29	1855	24
Michigan	Alpena	—27	Escanaba and Marquette	—26	1881	Fort Brady	—42	1873	60
Do						Ontonagon	—34	1861	11
Minnesota	Saint Vincent	—42	Saint Vincent	—44	1881	Fort Ripley	—44	1860	17
Mississippi	Vicksburgh	30	Vicksburgh	10	1875	Fayette	7	1879	8
Missouri	Springfield and Saint Louis.	6	Saint Louis	—16	1875	Ashly	—27	1879	4
Montana	Terry's Landing	—36	Fort Benton	—55	1875	Fort Benton	—58	1875	12
Do						Fort Ellis	—53	1872	14
Nebraska	North Platte	— 8	North Platte	—27	1881	Camp Sheridan	—29	1879	4

Table of comparative minimum temperatures for the month of January, 1882—Continued.

State or Territory.	Minimum for January, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Stations.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°			°		*Years.*
Nevada	Winnemucca	—4	Winnemucca	—14	1879	Fort Ruby	—23	1864	5
Do						Fort Halleck	—22	1868	12
New Hampshire	Mount Washington	—39	Mount Washington	—46	1875	Dartmouth College	—34	1848	18
Do						Stratford	—33	1861	11
New Jersey	Barnegat	—1	Barnegat	—10	1875	Paterson	—13	1866	6
Do						Burnt Mills	—24	1875	8
New Mexico	Santa Fé	7	Santa Fé	—9	1881	Fort Wingate	—16	1864	20
New York	Albany	—14	Albany	—18	1878	Salem	—40	1840	20
Do						Gouverneur	—38	1835	40
North Carolina	Charlotte	16	Charlotte	11	'79, '81	Ashville	—1	1879	4
Do			Kittyhawk	11	1879				
Ohio	Cleveland	2	Columbus	—20	1879	Jacksonburgh	—25	1879	8
Do						Marietta	—22	1852	53
Oregon	Umatilla	4	Umatilla	—25	1879	Fort Dalles	—23	1862	16
Pennsylvania	Erie	—2	Erie	—15	1875	Carlisle Barracks	—28	1873	37
Do						Philadelphia	—9	1866	113
Do						Fleming	—26	1861	6
Rhode Island	Newport	—8	Newport	3	1879	Providence	—17	1866	36
Do						Fort Adams	—13	1873	41
South Carolina	Charleston	26	Charleston	23	1879	Fort Moultrie	14	1835	38
Do						Charleston	16	1852	105
Tennessee	Knoxville	18	Knoxville	—14	1877	Clarksville	—10	1879	8
Texas	Fort Elliott	4	Pilot Point	—5	1879	Fort Davis	—15	1873	28
Utah	Salt Lake City	0	Salt Lake City	2	'80, '81	Coalville	—17	1879	7
Vermont	Burlington	—25	Burlington	—17	1878	Woodstock	—30	1875	8
Do						Craftsburgh	—25	1866	9
Virginia	Chincoteague	8	Fort Whipple	—8	1881	Wytheville	—6	1879	9
Washington Territory	Colfax	—8	Dayton	—2	1881	Fort Colville	—30	1862	21
West Virginia	Morgantown	9	Morgantown	—6	1875	Helvetia	—14	1879	6
Wisconsin	La Crosse	—11	La Crosse	—31	1875	Embarrass	—40	1875	19
Do						Fort Howard	—30	1823	31
Do						Fort Winnebago	—29	1841	12
Wyoming	Cheyenne	—12	Cheyenne	—38	1875	Fort Sanders	—61	1875	18
Do						Fort Laramie	—40	1864	29

1881, *by Ja*

Barometer			Rain or melted snow.		Winds.	
Great	covered.					
Height.	9 p. m.	Monthly.	No. of days it fell.	Amount.	Resultant.	No. of times in 1,000.
Inch.	*enths.*	*Tenths.*		*Inches.*	*Direction from*	
30.665	5.09	5.86	10.6	3.331	N. 63° 55′ W.	286
30.862	4.84	5.59	9.6	3.180	N. 66° 33′ W.	264
30.625	4.92	5.76	12.0	3.860	N. 61° 28′ W.	246
30.495	5.12	5.92	11.9	3.994	N. 65° 57′ W.	165
30.396	4.72	5.61	11.3	4.100	N. 89° 28′ W.	141
30.298	4.42	5.52	11.2	4.281	S. 69° 28′ W.	204
30.269	4.23	5.39	10.9	4.122	S. 65° 49′ W.	193
30.322	4.21	5.43	10.1	4.765	S. 72° 34′ W.	144
30.392	3.96	5.19	8.3	3.822	S. 88° 09′ W.	127
30.651	4.10	5.00	8.8	3.223	N. 78° 44′ W.	227
30.616	4.94	5.59	10.1	3.614	N. 73° 34′ W.	266
30.682	5.18	6.01	10.6	3.532	N. 67° 06′ W.	268
	m.					
30.862	5.02	5.81	30.7	10.036	N. 66° 55′ W.	275
30.625	4.92	5.76	35.2	11.954	N. 69° 36′ W.	178
30.322	4.29	5.47	32.3	13.205	S. 68° 24′ W.	174
30.651	4.34	5.26	27.1	10.658	N. 78° 15′ W.	206
30.862	4.65	5.58	125	45.939	N. 77° 22′ W.	194

Frosts.—In the various districts they were reported on the following dates: New England, 1st to 8th, 10th to 31st; Middle Atlantic States, 1st to 8th, 10th, 11th, 12th, 14th, 15th, 17th to 26th, 28th to 31st; South Atlantic States, 1st to 5th, 22d to 26th, 30th, 31st; Florida Peninsula, Cedar Keys, 2d, 3d, 31st; East Gulf States, 2d, 3d, 23d; West Gulf States, 2d, 11th, 17th, 18th, 19th, 22d, 23d, 29th, 30th, 31st; Rio Grande Valley, 1st, 2d, 16th, 18th, 21st, 31st; Ohio Valley and Tennessee, 1st to 7th, 9th, 10th, 12th, 14th to 25th, 28th to 31st; Lower Lake region, 1st to 31st; Upper Lake region, 1st to 31st; extreme Northwest, 1st to 31st; Upper Mississippi and Missouri Valleys, 1st to 31st; Northern Slope, 1st to 31st; Middle Slope, 1st to 6th, 8th to 31st; Southern Slope, 12th, 16th to 19th, 22d, 23d, 29th, 30th, 31st; Southern Plateau, 1st, 2d, 4th to 31st; Middle Plateau, 1st to 4th, 8th, 9th, 10th, 13th to 31st; Northern Plateau, 3d, 7th, 12th, 13th, 15th, 16th, 19th to 25th; North Pacific Coast region, 9th to 12th, 15th to 22d, 25th, 27th to 30th; South Pacific Coast region, 1st, 3d to 23d, 25th to 31st.

Ice.—Regarding its formation in the northern sections, this subject is considered elsewhere in the Review under the head of *Ice in rivers and harbors.* The following are exceptional cases of ice formation in the southern sections of the country: Augusta, Ga., 2d, 23d; Jacksonville, Fla., 2d; Sloop Point, N. C., 2d; Portsmouth, N. C., 2d, 3d, 23d; Pensacola, Fla., 2d; Indianola, 17th; Victoria, Tex., 17th; Cuero, Tex., 17th, 19th; Mason, Tex., 17th, 19th; Eagle Pass, Tex., 17th; Tucson, Ariz., 18th; Florence, Ariz., 9th, 10th, 11th; Los Angeles, Cal., 27th; San Diego, Cal., 29th; Red Bluff, Cal., 9th, 10th to 14th, 18th, 24th; Visalia, Cal., 11th, 12th, 13th; Point San José, Cal., 13th, 14th; Saint Augustine, Fla., 2d, very thin.

Low temperatures.—The following are notable instances of extremely cold weather in various portions of the country attending the development and progress of areas of high barometer: *California:* San José, 13th, weather excessively cold during the past three days. Marysville, 13th, "phenomenally cold weather" for past two days; during the night of the 12th ice formed in gutters sufficient to bear a man's weight; temperature 9° below freezing. North San Juan, 13th, coldest weather for many years past; temperature 10° to 14° below freezing. Stockton, 13th, coldest weather for many years; ice one inch thick near the town. Fresno, 13th, weather for past forty-eight hours coldest ever experienced; ice formed during night and in shady places remained all day; temperature 21° above zero. San Buenaventura, 13th, weather extremely cold; lambs and sheep dying from exposure. Los Angeles, 13th, severest weather ever known in southern California; "hills all around the city, down almost to the plains, white with snow." Merced, 13th, coldest weather for several years; ice formed more than one-half inch in thickness. Alta, 13th, minimum temperature 22° below freezing; reservoirs frozen sufficient to permit skating; all mining ditches frozen, rendering them temporarily useless. Yreka, 13th, minimum temperature 25° below freezing; coldest weather for several years. Campo, 12th, minimum temperature 6°.5, lowest for several years. San Gorgonio, month remarkable for continued low temperatures; minimum temperature 19° on the 12th, lowest for many years. *Canada:* Parry Sound, 24th, —38°. Saugeen, 24th, —16°. Port Stanley, 24th, —10°. Toronto, 24th, —18°. Kingston, 24th, —19°. Montreal, 24th, —26°. Anticosti, 24th, —16°. Quebec, 24th, —26°. *Connecticut:* Hartford, 24th, 10° to 18° below zero, and in the surrounding towns as low as —20°. Southington, 25th, minimum temperature —14°, coldest day in past twenty-five years. *Massachusetts:* Boston, 24th, reports from different parts of New England show the thermometer to have fallen from 10° to 37° below zero. Worcester, 24th, coldest weather for past twelve years; in various parts of the city, thermometer from 12° to 20° below zero; in some portions of the country, the temperature fell to —26°. *Missouri:* Saint Joseph, 16th, coldest day of the season; temperature 5° above zero. Carrollton, 16th, lowest temperature yet recorded for the season. Joplin, 16th, coldest of the season. Carthage, 16th, coldest of the season. *Montana:* Fort Missoula, 29th, minimum temperature —31°, lowest since station was opened. *New Brunswick:* Saint Johns, 18th, minimum temperature —28°, weather exceedingly severe. *Nevada:* Halleck, 12th, coldest weather for several years; temperature 30° below zero. Wells, 12th, exceedingly cold weather; temperature 30° below zero. Elko, 12th, temperature 25° below zero. Carlin, 12th, temperature 27° below zero; coldest weather ever experienced here. *New Jersey:* Long Branch, 24th, temperature —8°; preparations made for cutting ice. Red Bank, 24th, North Shrewsbury River frozen over; coldest weather for several years. *New Hampshire:* Colebrook, 24th, weather almost unendurable for the past two days. Portsmouth, 24th, temperature —24°; several vessels put into lower harbor, heavily encased in ice and unable to proceed further; crews suffered intensely from extreme cold, and in some cases were frost-bitten; fishermen report the most "intense weather" at sea that it has ever been their lot to experience. Contoocookville, 24th and 25th, minimum temperature —15°; coldest days during the past eleven years. *Rhode Island:* Providence, 24th, coldest day of the season; thermometer from 10° to 15° below zero. Newport, 24th, coldest weather for past ten years, temperature —6°; public schools closed, as it was found impossible to heat them. *New York:* Norwich, 24th, —33°; Poughkeepsie, 24th, all points along the river and from the interior of the river counties reported the experience of intense cold; thermometer 16° to 20° below zero. Rochester, 24th, —7°. Saranac Lake, 24th, —40°. Plattsburgh, 24th, —25°. Keesville, 24th, —24°. Port Henry, 24th, —22°. Ticonderoga, 24th, —25°. Whitehall, 24th, —35°. Glen's Falls, 24th, —26°. Lake George, 24th, —25°. Saratoga, 24th, —36°. *Vermont:* Burlington, 24th, maximum temperature —4°, minimum temperature —24°.8; coldest day since 1857.

PRECIPITATION.

The general distribution of rainfall over the United States and Canada for the month of January, 1882, is exhibited upon Chart No. III from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records of Signal Service stations, covering a period of several years, to which is subjoined a comparison of the present month with such averages. Upon comparison with the chart, the tabulated averages show four very irregular areas of excess and deficiency. The former condition prevails and the areas embrace the entire eastern portion of the country, except the South Atlantic States and the Florida Peninsula, while to the west of the Mississippi they include the extreme Northwest, Middle and Southern Slopes, Western Gulf States, Rio Grande Valley, and the Southern and Northern Plateaus. The departures of excess range from 0.11 inch in the Lower Lake region to 9.92 inches in Tennessee. The excess in this State, for the present month, is the largest and most remarkable since the opening of Signal Service stations. The most serious floods have resulted from this marked and sudden increase of precipitation, and the consequent damage to property has been almost without precedent. The areas of deficiency are comparatively small and widely separated, and the departures range from 0.11 inch in the Middle Plateau to 4.42 inches in the Middle Pacific Coast region. The deficiency on the Pacific Coast, especially in the two northern districts, is very large and quite unusual for the month. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1873, together with the corresponding districts: 1874, large excess, Lower Lake region; 1875, +3.02 inches, South Atlantic States; 1876, +3.15 inches, Ohio Valley and Tennessee, and —2.15 inches, South Atlantic States; 1877, —1.50 inches, Pacific Coast regions, and —0.95 inch, Western Gulf States; 1878, +3.76 inches, Middle and South Pacific Coast regions, and +2.17 inches, New England; 1879, +3.43 inches, Tennessee, and —2.12 inches, Eastern Gulf States; 1880, +6.21 inches, Portland, Oreg., —3.05 inches, Eastern Gulf States, and —2.45 inches, Middle and South Pacific Coast regions; 1881, +3.80 inches, Florida Peninsula, and +3.62 inches, Eastern Gulf States.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from regular Signal Service stations are shown in the table of comparative monthly rainfalls, as published in the lower left-hand corner of Chart No. III. The following items of importance in connection with this subject are reported by voluntary observers: *California:* Rio Vista, monthly rainfall considerably below the average. *Connecticut:* Southington, monthly rainfall considerably above the average. *Illinois:* Riley, monthly rainfall 1.57 inches, or 0.27 inch below the average for the past twenty-one years. *Indiana:* Vevay, monthly rainfall considerably below the average. *Kansas:* Yates Centre, monthly rainfall 0.25 inch above the average for the past two years. Lawrence, monthly rainfall 0.70 inch, or 0.56 inch below the average for the past fourteen years. Manhattan, monthly rainfall 0.42 inch, or 0.28 inch below the average for the past twenty-two years; the largest rainfall (2.35 inches) during this period occurred in 1878, and the lowest (0.05 inch) occurred in 1870. Wellington, monthly rainfall 1.05 inches, or 0.59 inch above the average for the past three years. *Iowa:* Clinton, monthly rainfall considerably below the average. *Maine:* Gardiner, monthly rainfall 3.56 inches, or 0.31 inch above the average for the past forty-six years. *Maryland:* Fallston, monthly rainfall 6.63 inches, or 3.40 inches above the average for the past eleven years, and 1.63 inches more than the maximum January rainfall for that period, which occurred in 1877. Sandy Springs, monthly rainfall considerably above the average for the past ten years. *Michigan:* Thornville, monthly rainfall considerably below the average. *Missouri:* Saint Louis, Missouri Weather Service reports monthly rainfall slightly above the average for the past forty-five years. *New Hampshire:* Contoocookville, monthly rainfall 3.10 inches, or 1.10 inch above the average for the past twelve years. *New York:* Palermo, monthly rainfall 2.95 inches, or slightly above the average for the past twenty-nine years; the largest January rainfall, 5.30 inches, occurred in 1874, and the smallest, 1.50 inches, occurred in 1866 and 1869; the snowfall for January, 1882, is less than for any January during the past twenty-nine years. North Volney, monthly rainfall 2.70 inches, or 0.56 inch below the average for the past nine years. *Tennessee:* Ashwood, monthly rainfall largely above the average, and the heaviest for the past twenty years. *West Virginia:* Helvetia, monthly rainfall 9.50 inches, or 4.56 inches above the average for the past six years.

Wytheville, monthly rainfall 7.08 inches, or 3.56 inches above the average for the past sixteen years.

Special heavy rainfalls.—4th, College Hill, Ohio, 2.50 inches. 10th and 11th, Clarksville, Tex., 2.50 in nine hours and thirty minutes. 11th, Murphy, N. C., 2.80. 12th, San Diego, Cal., 2.49; Poway, Cal., 3.79. 12th and 13th, Austin, Tenn., 3.00 in thirty hours. 15th, 16th, and 17th, Murphy, N. C., 5.10. 16th, Memphis, 2.97; Lexington, Mo., 2.50. 20th and 21st, Austin, Tenn., 2.60 in twenty-four hours. 21st, Fayette, Miss., 3.00. 24th, Galveston, 2.60. 27th, Ashwood, Tenn., 2.60. 27th and 28th, Forest Hill, N. C., 2.90 in twenty-five hours. 28th, Knoxville, 2.97; Helena, Ark., 2.80.

Largest monthly rainfalls, including melted snow.—Austin, Tenn., 18.11 inches; Ashwood, Tenn., 18.10; Knoxville, 16.98; Murfreesborough, Tenn., 16.30; Chattanooga, 14.74; Nashville, Tenn., 14.49; Murphy, N. C., 13.95; Vicksburgh, 13.83; Decatur, Ala., 13.70; Helena, Ark., 13.17; Memphis, 12.87; Fayette, Miss., 12.70; Cisco, Cal., 11.71; White Plains, N. Y., 11.50; Highlands, N. C., 11.32; New Ulm, Tex., 10.55; Helvetia, W. Va., 9.50; Colfax, Cal., 9.09; Shreveport, 9.08; Forest Hill, N. C., 8.90; Portsmouth, Ohio, 8.82; Paducah, Ky., 8.70; New Shoreham, R. I., 8.57; Clarksville, Tex., 8.50; Mount Ida, Ark., 8.40; Little Rock, Ark., 8.17; Galveston, 8.15; Confluence, Pa., 7.90; Fort Gaston, Cal., 7.72; Summit, Cal., 7.40; Green Springs, Ala., 7.36; College Hill, Ohio, 7.25; Charlotte, N. C., 7.24; Mount Washington, 7.20; Fort Canby, Wash., 7.16; Washington, D. C., 7.09; Wytheville, Va., 7.08; Federalsburgh, Md , 7.01; Fort Stevens, Oreg., 6.95; Cape Henry, Va., 6.92; New London, 6.90; Halifax, N. S., 6.84; Morgantown, W. Va., 6.78; Mobile, 6.77; Accotink and Johnsontown, Va., 6.75; Atlantic City, 6.74; Weldon, N. C., 6.64; Fallston, Md., 6.63; Quebec, 6.58; Newport, R. I., 6.55; Evansville, Ind., 6.50; New Geneva, Pa., 6.48; Sandy Hook, 6.47; Vineland, N. J., 6.45; Great Falls, Md., 6.44; Norfolk, Va., Atlanta, Ga., Poway, Cal., and Truckee, Nev., 6.40; Bowling Green, Ky., 6.39; West Chester, Pa., 6.38; Cairo, 6.35; Flemington, W. Va., 6.33; Atco, N. J., 6.32; Jacksonburgh, Ohio, 6.30; Louisville, 6.29; Yarmouth, N. S., 6.21; New York, 6.15; Golconda, Ill., 6.05; Lenoir, N. C., 6.00.

Smallest monthly rainfalls, including melted snow.—Yankton, 0.04 inch; Mojave, Cal., and Fort Meade, Dak., 0.05; Smithville, Dak., 0.08; San Simon, Ariz., 0.12; Huron, Dak., and Cheyenne, 0.14; Fort Keogh, Mont., and Macon, Mo., 0.18; Fort Randall and Rapid City, Dak., Golconda, Nev., Fort Assinaboine, Mont., and Fort Wallace, Kans., 0.20; Fort Snelling, Minn., 0.22; Bismarck and Fort Sully, Dak., and Corning, Mo., 0.23; Brunswick, Mo., 0.25; Fort Buford, Dak., 0.26; Hannibal, Mo., and Punta Rassa, Fla., 0.30; Fort Union, N. Mex., and Lemoore, Cal., 0.32; Deadwood, Dak., and Fort Elliott, Tex., 0.33; Terrace, Utah, 0.35; Pioche, Nev., 0.38; Hot Springs and Browns, Nev., 0.39; Benson, Ariz., Fort Custer, Mont., Camp near Presidio, Tex., Fort Fetterman, Wyo., and Tecoma, Nev., 0.40; Manhattan, Kans., 0.42; Newhall, Cal., and Fort Stevenson, Dak., 0.43; Burlington, Vt., and Fort Supply, Ind. T., 0.44; Almota, Wash., Blue Creek, Utah, Terry's Landing, Mont., and Genoa, Nebr., 0.45; North Platte, Nebr., 0.46; Northfield, Minn., and Santa Fe, N. Mex., 0.47; Fort Totten, Dak., and Clinton, Iowa, I.48; Oakland, Cal., 0.49; Fort Yates, Dak., Fort Ringgold, Tex., Minneapolis, Minn., Nora Springs, Iowa, and Chillicothe, Mo., 0.50.

Rainy days.—The number varied in New England from 18 to 26; Middle Atlantic States, 16 to 24; South Atlantic States, 11 to 24; Florida Peninsula, 7 to 8; East Gulf States, 13 to 22; West Gulf States, 9 to 24; Rio Grande Valley, 12 to 22; Ohio Valley and Tennessee, 13 to 27; Lower Lake region, 16 to 25; Upper Lake region, 11 to 22; Extreme Northwest, 6 to 19; Upper Mississippi Valley, 11 to 19; Missouri Valley, 4 to 10; Northern Slope, 5 to 14; Middle Slope, 3 to 11; Southern Slope, 3 to 15; Southern Plateau, 5 to 11; Middle Plateau, 9 to 14; Northern Plateau, 12 to 20; North Pacific Coast region, 18 to 23; Middle Pacific Coast region, 8 to 11; South Pacific Coast region, 5 to 9.

Cloudy days.—The number varied in New England from 7 to 24; Middle Atlantic States, 11 to 19; South Atlantic States, 6 to 23; Florida Peninsula, 1 to 4; East Gulf States, 9 to 23; West Gulf States, 3 to 22; Rio Grande Valley, 15 to 25; Ohio Valley and Tennessee, 16 to 23; Lower Lake region, 13 to 22; Upper Lake region, 6 to 16; Extreme Northwest, 3 to 8; Upper Mississippi Valley, 7 to 14; Missouri Valley, 4 to 13; Northern Slope, 3 to 13; Middle Slope, 0 to 6; Southern Slope, 6 to 17; Southern Plateau, 3 to 10; Middle Plateau, 4 to 11; Northern Plateau, 12 to 18; North Pacific Coast region, 13 to 18; Middle Pacific Coast region, 5 to 8; South Pacific Coast region, 3 to 7.

Snow.—The dates on which snow fell in the various districts are as follows: New England, 1st to 31st; Middle Atlantic States, 1st to 7th, 9th to 22d, 24th to 29th, 31st; South Atlantic States, 1st, 2d, 4th, 5th, 6th, 13th, 17th, 22d, 25th, 29th, 30th, 31st; West Gulf States, 16th to 20th, 29th, 30th; Rio Grande Valley, 17th; Tennessee, 1st, 17th, 30th, 31st; Ohio Valley, 1st to 6th, 10th to 13th, 15th to 25th, 29th, 30th, 31st; Lower Lake region, 1st to 4th, 6th, 7th, 9th to 17th, 19th to 25th, 29th, 30th, 31st; Upper Lake region, 1st to 29th; Extreme Northwest, 1st, 3d, 4th, 5th, 7th, 8th, 12th, 13th, 17th to 21st, 23d, 24th, 27th, 30th, 31st; Upper Mississippi Valley, 1st to 6th, 8th, 10th to 16th, 18th, 20th, 21st, 23d to 26th, 28th, 30th, 31st; Missouri Valley, 1st to 5th, 8th, 10th, 12th, 13th, 15th to 18th, 21st, 23d, 24th, 26th, 27th, 30th, 31st; Northern Slope, 1st to 28th, 30th, 31st; Middle Slope, 4th, 7th to 12th, 15th to 18th, 24th, 25th, 29th, 30th; Southern Slope, 16th, 18th, 29th, 30th; Southern Plateau, 7th to 20th, 24th, 25th, 26th, 28th, 29th, 30th; Middle Plateau, 3d, 4th, 6th to 15th, 18th, 19th, 23d to 27th, 30th, 31st; Northern Plateau, 1st, 3d to 7th, 9th to 14th, 16th, 18th, 19th, 20th, 23d to 31st; North Pacific Coast region, 8th, 10th, 11th, 25th, 26th, 27th, 30th; South Pacific Coast region, 12th to 15th. Particularly heavy or remarkable snow-falls were reported as follows: Los Angeles, Cal., 13th, hills all about the city white with snow. In the San Gorgonio Pass, two special freight trains were blockaded. The cuts in the pass were filled to a depth of from six to eight feet with drifted snow. Beyond the pass, on the Colorado desert, it rained heavy all night. Riverside, San Bernardino County, Cal., 13th, snow five inches and still falling; good sleighing in the orange groves. Tucson, Ariz., 12th, very heavy snow during the night on the desert west of station. 13th, fierce snow-storm raged in the mountains. Campo, Cal., 13th, snow fell to the depth of 20 inches; a brisk easterly wind prevailed at the time, which was remarkable owing to the fact that winds from that point are very seldom accompanied by precipitation; "all communication with the outside world cut off." 14th, ceased snowing at 10.20 a. m. 15th, nearly three feet of snow on the ground; many drifts eight feet deep; most remarkable storm ever known here; hundreds of birds were killed by exposure and stock suffered severely. 16th, all communication still cut off. 18th, snow slowly disappearing; reports from surrounding country show great losses in stock; roads still impassable. 19th, snow slowly disappearing. Petersburgh, Va., 1st, snow fell to the depth of 10 inches; trains delayed and all traffic suspended. Gore, Ohio, 4th, trains delayed and travel of all kinds generally impeded. Circleville, Ohio, 4th, all railroad traffic suspended. Cincinnati, 4th, snow fell to a depth of 10 inches, seriously impeding travel. South Lee, Mass., 31st, very heavy storm, continuing for twenty-four hours, snow fell to a depth of 25 inches; all communication seriously interfered with. Worcester, Mass., 31st, heaviest snow for years. At many places throughout the western portion of the State it fell to the depth of from 20 to 25 inches on the level. Great obstruction to travel, particularly on railroads; heavy snow-plows used night and day to keep the tracks clear. Sherman, Tex., 16th, snow and sleet all day. Fredonia, Kans., 16th, severe snow blizzard, most violent for several years; wind from the north estimated at 40 miles per hour. Shreveport, La., 29th, snowed furiously from 2.25 to 2.30 p. m., the flakes being remarkably large. San Gorgonio, Cal., 12th, remarkable fall of snow in the surrounding country. From San Bernardino eastward to the edge of the desert and from San Diego southward, snow fell to a depth of from 4 to 15 inches. There is no record of any such storm in former years, but some of the old Mexican inhabitants speak of a similar storm as occurring some fifty years ago. The storm was further noteworthy from the fact that it came from the east and was accompanied by a violent gale from that quarter, whereas the east wind is usually remarkable for its entire want of moisture.

Largest monthly snowfalls.—Cisco, Cal., 81 inches; Summit, Cal., 65.5; Truckee, Nev., 62; Mount Washington, about 54; Worcester, Mass., 53; Eagle Rock, Idaho, 44.1; Amherst, Mass., 40; Boca, Nev., 30; Cornish, Me., 36.5; Alpena, Mich., 36; Dyberry, Pa., 35; Antrim, N. H., 33; Springfield, Mass., about 32; Lunenburgh; Vt., 31.5; Gardiner, Me., 31.2; Ardenia, N. Y., Grafton, Auburn, and Contoocookville, N. H., and Rowe, Mass., 31., Somerset, Mass., and Orono, Me., 30; Milton, Pa., 29.5; Catawissa, Pa., 28.6; South Orange, N. J., 28.2; Dexter, Me., 28; Eastport, Me., and Thatcher's Island, Mass., about 27; Escanaba, about 26; Wells, Nev., 25.5; Prescott, Ariz., 25.3; New York City, about 25; Westborough, Mass., 25; Deer Park, Md., 24.7; Oswego, 24.6; Fall River, Mass., 24.5; Paterson, N. J., 24.3; Strafford, Vt., 23; Boston, about 23; Chester, Pa., 21.7; Flushing and White Plains, N. Y., and Colfax, Cal., 21; Woodstock, Vt., 20.5; Fallston, Md., Alta, Cal., and College Hill, Ohio, 20; Williamsport, Pa., about 20; Johnstown, N. Y., 19.4; Emmittsburg, Md., and Vevry, Ind., 19; Grand Haven, 18.9; Southington, Conn., 18.5; Jacksonburgh, Ohio, and New London, Conn., about 18; Pike's Peak, 17.8; Northport, Mich., and Rising Sun, Ind., 17.5; Albany, N. Y., and Sandy Springs, Md., 17; Pittsburgh, about 17; Newport, Vt., 16.7; San Gorgonio, Cal., 16.5; Silver City, N. Mex., 16.3; Meadville and Germantown, Pa., and Cumberland, Md., 16; Baltimore, about 16; Flemington, W. Va., 15.2; Cincinnati, 15.1; Phillipsburgh and Somerville, N. J., Portsmouth, Ohio, and Battle Mountain, Nev., 15; Johnsontown, Va., 14.7; Elko, Nev., 14.5; Columbus, Ohio, about 14.5; Princeton, N. J., 14.2; Wellsburgh, Pa., and Halleck, Nev., 14; Erie, 13.8; Helvetia, W. Va., 13.7; Charleston, Ill., and Waterburgh, N. Y., 13.5; Port Huron, about 13.5; Moorhead, Minn., 13.4; Carlin, Nev., 13; Fallsington, Pa., and Palisade, Nev., 12.7; New Athens, Ohio, and Neillsville, Wis., 12.5; Embarrass, Wis., Spiceland, Ind., Corinne, Utah, Bethel, Ohio, and Accotink, Va., 12; Indianapolis, about 11.8; Weldon, N. C., and Cairo, 11.7; New Shoreham, R. I.

11.6; Woodstock, Md., Vineland, N. J., and Logan, Iowa, 11; Wellsburgh, W. Va., 10.7; Wythville, Va., Promontory, Utah, Fort Missoula, Mont., Winnemucca, Nev., and North Lewisburgh, Ohio, 10.5; Eola, Oreg., Kelton, Utah, and Colton, Cal., 10.

Depth of snow on ground at the end of month.—Arizona: Prescott, 8 inches. *Arkansas:* Mount Ida, 4 inches; Little Rock, 5 inches. *California:* San Gorgonio, 4½ inches. *Colorado:* Pike's Peak, 6 inches. *Connecticut:* Southington, 14 inches; New London, 4 inches, New Haven, 8 inches. *Dakota:* Fort Stevenson and Huron, ½ inch. *District of Columbia:* Washington, 6 inches. *Idaho:* Eagle Rock, 8½ inches. *Illinois:* Adna, 3 inches; Champaign, ½ inch; Swanwick, 2 inches; Springfield, ¾ inch; Cairo, 5 inches. *Indiana:* Vevay, 5 inches; New Corydon, 2 inches; New Harmony, 7 inches; Saint Meinrad, 5¼ inches; Spiceland, 3 inches; Rising Sun, 9 inches; Indianapolis, 2½ inches. *Indian Territory:* Fort Gibson, 2.4 inches. *Iowa:* Guttenburgh, trace; Nora Springs, ¼ inch. *Kansas:* Yates Center, Holton, and Independence, 1 inch; Council Grove, 1½ inches; Wellington, 3 inches; Dodge City and Leavenworth, ½ inch. *Kentucky:* Bowling Green, 5½ inches; Louisville, trace. *Maine:* Orono, 10 inches; Gardiner, 15 inches; Eastport, 8 inches. *Maryland:* Woodstock, 11 inches; Deer Park, 6 inches; Sandy Springs, 5½ inches; Cumberland, 10 inches; Federalsburgh, 2½ inches; Fallston, 8 inches; Baltimore, 4 inches. *Massachusetts:* Springfield, 22 inches; Fall River, 7 inches; Somerset, 14 inches; Rowe, 15 inches; Amherst and Worcester, 26 inches; Thatcher's Island, 15 inches; Boston, 6 inches. *Michigan:* Northport, 5 inches; Battle Creek, ¼ inch; Marquette, 1½ inches; Escanaba, 4 inches; Alpena, 3 inches. *Minnesota:* Northfield, 2½ inches; Saint Vincent, 1½ inches; Saint Paul and Duluth, less than 1 inch; Moorhead, 8 inches. *Missouri:* Springfield, 1 inch; Saint Louis, ½ inch. *Montana:* Fort Assinniboine, 1 inch; Fort Missoula, 1½ inches; Fort Benton and Custer, 2 inches; Fort Shaw, about 1 inch. *Nebraska:* De Soto, trace. *Nevada:* Carson City, 5 inches; Winnemucca and Pioche, 3 inches. *New Hampshire:* Grafton, 20 inches; Auburn, 18 inches; Contoocookville, 10 inches; Mount Washington, 17 inches. *New Jersey:* Vineland, 2 inches; Freehold, 4½ inches; South Orange 12 inches; Princeton and Phillipsburg, 6 inches; Somerville, 5 inches; Sandy Hook, 2½ inches; Atlantic City, trace. *New Mexico:* Sante Fé, trace to 6 inches; Silver City, 1 inch. *New York:* Johnstown, 4 inches; Ardenia, 14 inches; Flushing, 10 inches, Cooperstown, 4 inches; Waterburgh, 1 inch; Palermo, trace; White Plains, 4 inches; Oswego, trace; New York City, 13 inches; Albany, 4½ inches. *North Carolina:* Murphy, 1 inch; Highlands, ½ inch. *Ohio:* College Hill, 5 inches; Westerville and North Lewisburgh, 2 inches; Ruggles, 1 inch; New Athens, 5½ inches; Jacksonburgh, 5 inches; Wooster, 1½ inches; Columbus, 3¼ inches; Cincinnati, 3½ inches. *Oregon:* Umatilla, ½ inch; Eola, 2 inches. *Pennsylvania:* Dyberry, 22 inches; Milton, 17½ inches; Fallsington and West Chester, 8 inches; New Castle, 3 inches; Meadville, 2½ inches; Catawissa, 15 inches; Wellsborough, 6 inches; Pittsburgh, 5 inches; Philadelphia, 2 inches; Williamsport, 10 inches. *Rhode Island:* New Shoreham, 6 inches; Newport, 5 inches. *Tennessee:* Ashwood, 2½ inches; Nashville, 2 inches; Memphis, 4 inches; Chattanooga, 1 inch. *Texas:* Henrietta, 1¾ inches; Denison, trace. *Utah:* Coalville, 4 inches; Salt Lake City, 1 to 3 inches. *Vermont:* Newport, 3 inches; Strafford and Woodstock, 6 inches; Burlington, ½ inch. *Virginia:* Accotink and Wytheville, 5 inches; Lynchburgh, 3½ inches. *Washington Territory:* Dayton, 3 inches; Olympia, 2 inches. *West Virginia:* Morgantown and Wellsburgh, 5 inches; Helvetia, 4 inches; Flemington, 2 inches. *Wisconsin:* Neillsville, 7 inches; Embarrass, 5 inches; La Crosse, 3½ inches; Madison, trace.

Rain or snow from a cloudless sky.—Burlington, Vt., 2d, 4th, light snow; 22d, light snow at intervals during the day and night. Mobile, 10th, 7.45 p. m., light rain, lasting about five minutes, during which 0.01 inch fell. Buffalo, 22d, light snow. Dubuque, Iowa, 2d, light snow from 8.05 to 8.25 a. m.; Ardenia, N. Y., 24th, between 4 and 5 p. m.

Hail.—Portland, Oreg., 25th; San Francisco, 24th, during a heavy shower of rain at 3.40 p. m., hail was reported to have fallen in several sections of the city. Sacramento, Cal., 31st. Red Bluff, Cal., 23d, hail-stones size of peas; 25th, from 5.10 to 5.15 p. m., size of peas; Visalia, Cal., 10th, 6 p. m., a sudden and heavy fall of hail lasting 10 minutes; Fort Canby, Wash., 31st.

Sleet.—The dates on which sleet fell in the various districts are as follows: New England, 1st, 6th, 8th to 11th, 13th, 16th, 26th, 27th; Middle Atlantic States, 4th, 5th, 8th to 12th, 16th to 19th, 22d, 25th, 26th, 28th, 31st; South Atlantic States, 1st, 25th, 26th, 30th, 31st; East Gulf States, 29th; West Gulf States, 16th, 17th, 18th, 29th; Rio Grande Valley, 17th; Ohio Valley and Tennessee, 3d, 4th, 6th, 10th, 12th, 13th, 15th to 18th, 24th, 25th, 30th, 31st; Lower Lake region, 6th, 10th, 12th, 21st, 25th; Upper Lake region, 6th, 7th, 8th, 13th, 26th; Upper Mississippi Valley, 4th to 7th, 10th, 12th, 16th, 20th, 24th, 26th; Missouri Valley, 4th, 10th, 16th, 26th, 30th; Northern Slope, North Platte, 12th; Middle Slope, 10th, 12th, 16th, 20th, 24th; Southern Slope, 16th, 17th, 29th; Southern Plateau, Tucson, 16th; Middle Plateau, Pioche, 24th; Northern Plateau, Fort Missoula, Mont., 2d, and Dayton, Wash., 25th.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 68 to 77; Middle Atlantic States, 69 to 87; South Atlantic States, 70 to 87; Florida Peninsula, 76 to 79; East Gulf States, 75 to 84; West Gulf States, 71 to 90; Rio Grande Valley, 78 to 91; Ohio Valley and Tennessee, 73 to 83; Lower Lake region, 71 to 86; Upper Lake region, 70 to 87; Extreme Northwest, 66 to 95; Upper Mississippi Valley, 63 to 78; Missouri Valley, 64 to 72; Northern Slope, 56 to 75; Middle Slope, 47 to 74; Southern Slope, 48 to 81; Southern Plateau, 54 to 64; Middle Plateau, 53 to 72; Northern Plateau, 73 to 85; North Pacific Coast region, 83 to 85; Middle Pacific Coast region, 68 to 70; South Pacific Coast region, 57 to 70. *High stations* report the following percentages not corrected for altitude: Santa Fé., 67.9; Denver, 56.8; Pike's Peak, 77.4; Mount Washington, 86.1.

WINDS.

The prevailing winds during the month of January, 1882, at Signal Service stations, are shown on chart No. II by arrows which fly with the wind. In the Middle Atlantic States and New England the winds are northwesterly; in the South Atlantic States southwesterly; in the Gulf States and Florida Peninsula, southerly; in the Ohio Valley and Tennessee, sothwest to northwest; in the Lake region, southwesterly; in the Upper Mississippi and Lower Missouri Valleys and in the Red River of the North Valley, southerly; in the Northern Slope, northwesterly; in the Middle and Southern Slopes, south to west; in the Plateau regions, variable; in the North Pacific Coast region, southerly, and in California, northerly.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 28.892 miles; Pike's Peak, 19.172; New Shoreham, R. I., 13.733; Delaware Breakwater, 13.423; Thatcher's Island, Mass., 12.602; Sandy Hook, 11.955; Hatteras, 11.501; Kittyhawk, 11.436; Cape May, 11.310; Sandusky, 10.841; Rochester, 10.793; Buffalo, 10.651; Barnegat, 10.557; Grand Haven, 10.292; Indianola, 10.135; Fort Shaw, Mont., 10.039; Cape Henry, Va., 9.879; Newport, R. I., 9.612; Eastport, 9.386; Chincoteague, Va., 9.301; Portsmouth, N. C., 9.280; Oswego, 9.125; Champaign, Ill., 9.070; Milwaukee, 8.962; Macon, N. C., 8.960; Erie, 8.908; Huron, Dak., 8.829; Boston, 8.742; Cleveland, 8.609; Galveston, 8.597; Detroit, 8.536; Dodge City, 8.500; Cheyenne, 8.328; Fort Elliott, Tex., 8.301; Burlington, Vt., 8.185; Port Huron, 8.160; Marquette, 8.134; Atlanta, 8.088; North Platte, 8.046; Fort Assinnniboine, Mont., 8.040. The smallest are: La Mesilla, N. Mex., 1.221; Rio Grande, Tex., 1.236; Roseburgh, Oreg., 1.762; Fort Missoula, Mont., 1.800; Salt Lake City, 2,100; Florence, Ariz., 2.177; Lynchburgh, 2.338; Silver City, N. Mex., 2,541; Tucson, Ariz., 2,812; Boisé City, Idaho, 2.863.

High winds.—The following are maximum velocities, with direction at time of occurrence, for the various dates on which 50 miles per hour was exceeded, on the summit of Mount Washington; 100 miles, NW., 2d; 70 NW., 3d; 88, N., 4th; 68, S., 6th; 82, NW., 7th; 92, W., 8th; 100, NW., 9th; 80, NW., 10th; 100, NW., 11th; 88, NW., 12th; 100, W. and SW., 13th; 110, NW., 14th; 120, NW., 15th; 65, NW., 16th; 97, NW., 17th; 88, W., 18th; 60, NW., 19th; 60, NW., 20th; 60, SW., 21st; 120, NW., 22d; 88, NW., 23d; 96, NW., 24th; 67, NW., 25th; 65, NW., 26th; 126, NW., 27th; 72, SW., 28th; 120, NW., 29th; 116, NW., 30th; 58, NW., 31st. On the summit of Pike's Peak the following maximum velocities were reported: 62 miles, NW., 1st; 54, W. and NW., 5th; 50, SW., 6th; 50, NW., 21st; 54, SW., 24th; 52, W., 26th. Other stations reporting velocities of 50 miles per hour or over are as follows: Fort Stevenson, Dak., 56, NW., 17th; Indianola, 53, N., 16th; Grand Haven, 50, NW., 26th; Sandusky, 51, W., 22d; Buffalo, 51, SW., 27th; Rochester, 56, W., 27th; Champaign, Ill., 52., W., 26th; Thatcher's Island, Mass., 52, NE., 2d, and 57, NW., 27th; New Shoreham, R. I., 50, N., 1st and 2d, and 55 NE., 31st; Sandy Hook, 54, E., 31st; Cape May, 54, N. W., 14th, 63, W., 22d, and 52, NW., 29th; Delaware Breakwater, 52, NW., 22d and 29th; Cape Henry, Va., 52, NW., 1st.

Local Storms.—Most of the following storms attended the development and progress of low areas Nos. XII and XIII. The latter rapidly succeeded the former and pursued its general course, and the partial restoration of atmospheric equilibrium between the passage of the two storm centers caused sudden and violent westerly gales at many points in the northern districts. Ventura County, Cal., 12th, very violent wind-storm (said to be a tornado) occurred in the Ojai Valley, destroying houses and barns and uprooting and breaking off the strongest trees. Wilmington, Cal., 12th, most terrible storm for many years, accompanied by a blinding fall of snow and sleet; several vessels dragged anchor in the harbor, and one of them became a total wreck. Oakland, Cal., 13th, heavy northerly gale, signs destroyed, fences blown down, trees uprooted, wind-mills dismantled, and several houses damaged. Martinsburgh, N. Y., 26th, very violent wind-storm, over

25 buildings more or less demolished. Lowville, N. Y., many buildings unroofed and some entirely demolished. Harrisburgh, N. Y., 27th, barns unroofed. Greig, N. Y. 27th, barns and houses unroofed and other property damaged. Constableville, N. Y. 27th, barns unroofed, fences blown down, and trees uprooted. High Market, N. Y., 27th, several buildings unroofed. San Diego, Cal., 12th, most remarkable storm since 1847, a period of thirty-four years; continuing for thirty-eight hours, it gave the largest rainfall of any one storm in the month of January during the above period, and the largest but two of all the storms recorded. It was especially remarkable as being the coldest storm of which there is any record. On the morning of the 14th snow-flakes were observed, melting as fast as they fell, a phenomenon never before noted at this station, which fact is verified by persons who have resided in San Diego for the past forty years. Very rarely and at long intervals light snow has been seen on the summit of San Miguel Mountain, 15 miles distant. Snow is frequently seen on the Cuyamaca Peaks, 45 miles to the northeast, and occasionally on Lyons Peak, 35 miles eastward. But accompanying this storm, snow varying in depth from two to five inches was reported from the low hills at El Cayon, Poway, Bernardo, and other points within 15 to 25 miles of station, "where such a thing was never before experienced." The magnitude of the fall of rain and snow was such that 12 hours from the commencement of the storm San Diego River began flowing into False Bay, a "change almost unprecedented." In this connection the following comparative statement of January rainfalls will be found of interest: 1871, 0.69 inch; 1872, 0.99; 1873, 0.44; 1874, 3.11 inches; 1875, 2.38; 1876, 2.47; 1877, 1.05; 1878, 1.45; 1879, 3.54; 1880, 0.61; 1881, 0.52; 1882 (to date, January 13th), 3.02 inches. Oswego, N. Y., 27th, about 5 a. m., severe wind storm, considerable damage to telegraph and telephone wires; buildings unroofed, fences and trees blown down, and much other damage caused; severest gale experienced for several years. Thompsonville, Conn., 27th, several buildings unroofed and considerable damage caused to farmers in the surrounding country. Stamford, Conn., 27th, one large building demolished and much damage to trees, fences, and houses. Brattleborough, Vt., 27th, trees uprooted and broken down and several buildings demolished. North Hinsdale, Vt., 27th, buildings unroofed and telegraph and telephone wires rendered useless. Chesterfield, Vt., 27th, buildings blown down and forest trees uprooted. Westfield, Mass., 27th, considerable damage to buildings, fences, and shade trees. Joplin, Mo., 15th, very heavy wind-storm, demolishing trees, fences, and out-buildings. Troy, N. Y., 27th, heavy westerly gale, causing much damage to property. Lansingburgh, N. Y., 27th, several buildings unroofed. Castleton, N. Y., 27th, buildings unroofed and other property considerably damaged. Mineville, N. Y., 27th, several buildings blown down and other property damaged. Wilmington, Vt., 27th, considerable damage to trees and buildings. Marlborough, Vt., 27th, very heavy wind storm, causing much damage to property. Keene, N. H., 27th, several buildings blown down and quite a number unroofed. Winchester, N. H., 27th, large number of barns unroofed and houses partially demolished. Greenfield, Mass., 27th, several buildings unroofed and blown down. Schools were closed from fear of damage to buildings. Holyoke, Mass., 27th, considerable damage to property by the unroofing of buildings and the destruction of trees and fences. Southwick, Mass., 27th, buildings unroofed and otherwise damaged. Lewiston, Me., 27th, considerable damage to windows, fences, signs, chimneys, and church steeples. Burlington, Vt., 27th, heaviest wind storm for many years; great destruction of property by the unroofing and blowing down of buildings; large trees uprooted or broken off. The ice in Burlington Bay and Lake Champlain was swept out of sight with "amazing rapidity." Much havoc took place in the various lumber yards. Pittsfield, Mass., 27th, 9 a. m., very heavy wind-storm, unroofing buildings, destroying trees, and causing considerable damage in the surrounding country. In the city business was almost entirely suspended, horses and sleighs were blown prostrate as the gale struck them, and the streets were strewn with large quantities of *débris*. Most violent storm since the "terrible tornado" of July 16, 1879. Saratoga, N. Y., 27th, heavy wind-storm during early morning, proving very destructive in surrounding country. Rockland, Me., 27th, several buildings unroofed and some damage to shipping in harbor. Chelsea, Me., 27th, several buildings demolished. East Concord, N. H., 27th, considerable damage to property. Chicopee, Mass., 27th, bridge over the Connecticut River destroyed; several buildings damaged. Lynn, Mass., 27th, several buildings unroofed and otherwise damaged. Rochester, N. H., 27th, several buildings damaged and other property destroyed. Cheshire, Mass., 27th, heavy wind-storm; steam-engine house and ice-houses, the property of the Housatonic Ice Company, were blown down; several other buildings completely demolished. Loss to property over $5,000. North Adams, Mass., 27th, three large brick buildings, aggregating over 800 feet in length, belonging to the Zylorite Works, were completely demolished. Newburyport, Mass., 27th, several buildings unroofed and otherwise damaged. Nashua, N. H., 27th, very heavy wind-storm, considerable damage to property. Springfield, Mass., 27th, heavy wind-storm about 10 p. m., considerable damage in city and surrounding country. West Turin, N. Y., 27th, consider-

able property destroyed. Naumburg, N. Y., 27th, barns unroofed and other buildings badly damaged; loss of property in vicinity quite severe. The gale was accompanied by rain, which began about 2 p. m. The western sky was very dark and immense dark masses of cloud passed rapidly from west to east during the storm. Rondout, N. J., 27th, houses and other buildings unroofed, fences demolished, and trees uprooted; severest wind-storm for several years. Along the line of the Ulster and Delaware Railroad a great many telegraph-poles were broken off or torn out of the ground. Ancram, Dutchess County, N. Y., 27th, large destruction of property in town and surrounding country. Winthrop, Me., 27th, heavy westerly gale; considerable damage to property. Ballston Spa, N. J., 27th, heaviest wind-storm experienced for several years; much damage to property. Bloodville, N. J., 27th, very heavy wind storm; buildings damaged. Rock City, N. Y., 27th, heavy wind-storm; considerable property destroyed. Wabash, Ind., 26th, buildings unroofed, trees and fences blown down. Fort Wayne, Ind., 26th, heavy westerly gale, damaging buildings and other property. Grand Haven, Mich., 26th, several buildings and other property damaged during a heavy westerly gale.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for January, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 83.18 per cent. The percentages for the four elements are: Weather, 81.32; direction of the wind, 76.27; temperature, 86.60; barometer, 88.52 per cent. By geographical districts they are: For New England, 84.0; Middle Atlantic States, 88.0; South Atlantic States, 83.6; Eastern Gulf States, 82.1; Western Gulf States, 80.7; Lower Lake region, 87.7; Upper Lake region, 83.6; Tennessee and the Ohio Valley, 85.4; Upper Mississippi Valley, 81.9; Lower Missouri Valley, 76.7; Northern Pacific Coast region, 83.3; Middle Pacific Coast region, 82.1; Southern Pacific Coast region, 85.3. There were 119 omissions to predict (40 being due to the absence of reports from the Pacific coast) out of 3,813, or 3.12 per cent. Of the 3,694 predictions that have been made, 198, or 5.36 per cent. are considered to have entirely failed; 200, or 5.42 per cent. were one-fourth verified; 437, or 11.83 per cent. were one-half verified; 231, or 6.25 per cent. were three-fourths verified; 2,628, or 71.14 per cent. were fully justified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—Ninety-seven cautionary signals were displayed during the month of January, 1882, of which 94, or 96.90 per cent., were fully justified by winds of 25 miles per hour, or over, at or within a radius of 100 miles of the station. One hundred and nine off-shore signals were displayed, of which 80, or 73.39 per cent., were fully justified; 94, or 86.23 per cent., were justified as to direction; 106, or 97.24 per cent., were justified as to velocity. Twenty-two off-shore signals were changed from cautionary. Two Northwest signals were displayed, both of which were fully justified. Two hundred and eight signals of all kinds were displayed, of which 176, or 84.61 per cent., were fully justified. The above does not include signals ordered at 69 display stations, where the velocity is only estimated. One hundred and forty-seven winds of 25 miles or over were reported for which no signals were ordered. Thirty-four signals were ordered late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of January, 1882. Except throughout the Ohio Valley and Tennessee, embracing the Ohio, Cumberland, and Tennessee Rivers, and a portion of the central Mississippi, the rivers have remained at a moderate stage throughout the month. In the rivers above named the changes have been remarkable, and in one instance unprecedented, as in the case of the Cumberland at Nashville, where the rise reached a point never before recorded, being, on the 22d, 54 feet and 7 inches above low-water mark, or 12 feet and 7 inches above the danger-line. The very serious floods accompanying the heavy rises in these rivers are fully described elsewhere in the Review under the head of *Floods*. The Red River reached its highest stage at Shreveport on the 31st, water within 2 feet and 9 inches of the danger-line. The Arkansas reached its highest stage at Little Rock on the 18th and 19th. At most stations on the Missouri the river was frozen over throughout the month. The Mississippi above Dubuque remained frozen; below that station the highest stage was reached, with few exceptions, on the 30th and 31st. At four stations the water rose above the danger-line, as follows: Cairo, 7 feet and 8 inches; Memphis, 11 inches; Vicksburgh, 22 inches, and New Orleans, 1 inch. In the Ohio the highest stage was reached between the 15th and 28th, and all stations reported rises above the danger-line of from 18 to 27 inches. In the Cumberland, Tennessee, Monongahela, and Savannah Rivers the highest stages were reached between the 18th and 28th, and in the two former were above the danger-line from 112 to 151 inches.

Ice in rivers and harbors.—*Mississippi River:* Le Claire, Iowa, 16th, river frozen over opposite city and at the head of the upper rapids; ice 10 inches thick. Keokuk, 1st, full of floating ice; steamers between this point and Saint Louis gone into winter-quarters-navigation closed; 3rd, floating ice. Davenport, 1st to 7th, 9th to 27th, 30th, 31st, floating ice; 8th, 28th, river clear of ice. Burlington, Iowa, 1st to 6th, 9th, 10th, 13th to 19th, floating ice; 7th, 11th, clear of ice. Dubuque, 1st, ferry-boat stopped by the ice; 13th, frozen over; 18th, teams crossing on the ice. La Crosse, frozen over during the month. Saint Paul, frozen over during the month. Saint Louis, 1st to 4th, 6th, 9th, 10th, 20th, 22d, 30th, 31st, floating ice. Muscatine, Iowa, 28th to 31st, river closed by ice. *Missouri River:* Yankton, frozen over during the month. Omaha, frozen over during the month. Leavenworth, 1st to 6th, 16th to 20th, 22d to 26th, 29th to 31st, floating ice; 7th, 21st, 27th, clear of ice. *Republican River:* Clay Centre, Kans., 28th, frozen over, ice eight inches thick. *Kennebec River:* Gardiner, Me., 2d, river closed by ice. *Yuba River:* Marysville, Cal., 13th, river full of floating ice; coldest weather for years. *Des Moines River:* Des Moines, 17th, river partly covered with ice. *Forest Lake:* Madison, Wis., 2d frozen over. *Yellowstone River:* Terry's Landing, Dak., river closed by ice. Fort Keogh, 5th, river frozen over. *Big Horn River:* Fort Custer, 9th, river closed by ice. *Embarass River:* Charleston, Ill., 5th, river fozen over; 24th, ice 3 to 5 inches in thickness. *Rock River:* Rockford, Ill., 1st, river frozen solid. *Sault Saint Marie River:* Fort Brady, Mich., 1st, ice forming on river; 3d, river frozen over. *Lake Ontario:* Madison Barracks, N. Y., 2d, bay frozen over. *Niagara River:* Buffalo, 4th, frozen over; 26th, ice breaking up; 27th, gorging. Fort Niagara, 23d, 31st, river full of floating ice. *Lake Huron:* Port Huron, 23d, Lake Huron Bay covered with ice-floes; 24th, ice-bridge formed across the bay from Fort Gratiot light-house to Point Edwards; 27th, ice-bridge broken. Alpena, 1st, Thunder Bay frozen over, navigation closed. *Grand River:* Grand Haven, 4th, frozen over; 14th, full of ice; 25th, frozen over with exception of channel, which was kept open by steamers. *Lake Superior:* Duluth, 4th, lake full of broken ice as far as the eye could reach; 8th, clear of ice; 10th, frozen over 600 feet from the docks; 15th, opened during evening; 17th, frozen; 18th, ice disappeared; 20th, frozen; 21st, clear of ice; 22d, frozen; 28th, large fields of ice went out during storm; 31st, ice melting rapidly. *Thunder Bay River:* Alpena, 1st, frozen over, navigation closed. *Hudson River:* Peekskill, N. Y., 24th, river frozen solid for many miles to the northward; ice cutting very active everywhere north of Catskill. Albany, 1st, 3d, floating ice; 4th, river full of ice rendering navigation dangerous; 5th, navigation closed. Poughkeepsie, N. Y., 24th, steamer Daniel S. Miller, bound for New York, became fast in the ice off Cold Spring in the Highlands. New York, 5th, considerable floating ice in North Hudson River; 29th, floating ice in river and harbor; 4th, navigation on the upper Hudson closed in consequence of ice. In 1809 the river was open until January 19th; during the last one hundred years, navigation continued later than December, only eleven times, the latest cessation occurring in 1801, when navigation did not close until the 3d of February. *Chincoteague Bay:* Chincoteague, 4th, 5th, floating ice in harbor; 24th, harbor partially frozen over, navigation obstructed; 25th, ice in harbor breaking up. *Core Sound:* Cape Lookout, 22d, frozen over. *Lake Michigan:* Milwaukee, 5th, lake frozen. Chicago, 3d, lake frozen; 8th, clear of ice. *Black River:* Port Huron, 1st, frozen over; 17th, ice 7 inches thick. *Saint Clair River:* Port Huron, 2d, light floating ice; 4th, 5th, 17th, 18th, 19th, 22d, 23d, 24th, 27th, 29th, 30th, 31st, floating ice. *Maumee River:* Toledo, 2d, frozen over; 8th, ice breaking up; 13th, floating ice; 14th, frozen over. *Cuyahoga River:* Cleveland, 2d, frozen over; 4th, 5th, 18th, floating ice; 6th, clear of ice; 23d, frozen over; 25th, ice broken up by tugs. *Lake Erie:* Cleveland, 4th, 5th, 18th, lake full of ice as far as eye could reach. Erie, 1st, ice formed in harbor to a depth of 8 inches; 25th, ice breaking up causing considerable damage to the breakwater. *Lake Champlain:* Burlington, 5th, lake frozen between the docks; 23d, navigation closed. *Monongahela River:* Pittsburgh, 4th, 25th, 26th, floating ice; Morgantown, 4th, partly frozen over. *Detroit River:* Detroit, 2d, floating ice. *Sandusky Bay:* Sandusky, 1st, frozen over during night; navigation suspended; 10th, ice breaking up; 12th, clear of ice; 14th, frozen over. *Penobscot River:* Bangor, 2d, navigation closed. *Quinnipiac River:* New Haven, 4th, harbor and river frozen over. *Connecticut River:* New Haven, 4th, navigation closed, a later date than for past forty years; steamer Granite State, from New York to Hartford, caught in the ice at Lynn. Springfield, 4th, ice forming rapidly; 5th, river closed; 15th, ice melting and breaking up.

Floods.—The extraordinarily heavy rains in Tennessee and extending thence southwestward into the northern portions of the West Gulf States caused very serious floods and enormous destruction of property. The destructive work of high water as herein noted is confined to the last half of the month, and in several instances to the last week, which shows how sudden and extremely heavy must have been the precipitation. In many sections of the flooded district it has no parallel during past fifty years. *Alabama:* Montgomery, 21st, river slowly falling, no special danger from the flood. Mobile, 19th, lower portion of the city inundated by the overflow of Tombigbee River. Tuscaloosa, 19th, river 56 feet above low-water mark and the water still rising. Bridgeport, 20th, river remained stationary for several hours but commenced rising during the night; damage to property slight. Decatur, 21st, heaviest rain of the season; river 25 feet above low-water mark and rising slowly; river six miles wide and lacks only three feet of reaching the high-water mark of 1867. *Arkansas:* Hopefield, 28th, most of the town submerged; great destruction of property; loss to private parties very heavy. *Georgia:* Rome, 21st, the heavy rains of the past week caused rapid rises in all streams and in some cases serious floods. *Illinois:* Cairo, 21st, with two exceptions the Ohio River at this point was higher than at any time during the past ten years. At 4 p. m., river 45.6 feet above low-water mark and rising slowly. The following are the dates and heights of the highest water at this station during the past ten years: 1872, April 20th, 29.2 feet; 1873, February 26th, 41.3 feet; 1874, April 26th, 47.4 feet; 1875, April 21st, 33.8 feet and August 8th, 45.1 feet; 1876, April 7th, 46.4 feet; 1877, April 15th, 40.6 feet; 1878, March 17th, 35.9 feet; 1879, January 26th, 36 feet; 1880, March 23d, 44.5 feet; 1881, April 20th, 45.9 feet; 1882, January 21st, 45.6 feet. *Louisiana:* New Orleans, 19th, high water reported from many sections of the State. The Atchafalaya River overflowed its banks submerging the adjacent lowlands. The flood of Big Black River spread in every direction; about 30 miles of the Chicago, Saint Louis and New Orleans Railroad under water; many culverts destroyed and much of the road-bed washed away. 28th, a crevasse 75 feet wide and 3 feet deep formed in the O'Brien levee, just below the Quarantine station; country flooded for a distance of two miles back. 29th, crevasse formed at Lockport, Bayou la Fourche, gap 28 feet wide and 20 feet deep. *Mississippi:* Corinth, 20th, the tracks of the Memphis and Charleston Railroad submerged, and travel suspended. Canton, 21st, from this station to Grenada, a distance of 87 miles, the Jackson Railroad has been abandoned. Ten to fifteen miles of the road was submerged to a depth of from two to four feet. Rain has fallen almost incessantly in this portion of the State for the past two weeks; Big Black River is remarkably high, and much damage has resulted from its overflow. Goodman, 19th, lower portion of the city inundated, the turnpike road destroyed, and the bridge over the Big Black River washed away. *Pennsylvania:* Bradford, 27th, heavy rains and ice gorges in the creeks caused serious flooding in the northern and eastern sections of the city. Many buildings surrounded by water, effecting considerable loss of property. *Tennessee:* Nashville, 10th, from the continued and heavy rains of the past few days lowlands flooded in northern part of city to a considerable extent; river rising rapidly and filled with heavy drift-wood. 11th, river rising slowly; large quantity of logs carried away by the high water; heavy drift-wood in river; 9 p. m., river 41 feet and 8 inches above low-water mark, or 4 inches below the danger-line. 12th, with continued rains river rose rapidly, reaching 42 feet and 2 inches above low-water mark, or 10 inches above the danger-line. All the lower portions of the city and contiguous bottoms flooded. About 200 families forced to abandon their homes. An immense quantity of lumber and saw-logs have been swept down the river, and over 3,000 walnut logs lost in one of the tributaries of the Upper Cumberland. 13th, river rising rapidly, being 46 feet and 9 inches above low-water mark, or 5 feet and 5 inches above the danger-line; heavy drift-wood in river. The first story of houses in the flooded portion of the city completely under water; people obliged to make use of improvised rafts in order to leave their dwellings. 14th, river 47 feet and 8 inches above low-water mark or 6 feet and 4 inches above the danger-line; large amount of drift-wood in river. All mills on the Edgefield side of the city surrounded by water and their operations suspended. The Bucket Factory, Brick Yards, Southern Pump Factory and Indiana Mills inclosed by water and all operations suspended. Large number of houses flooded and deserted. 15th, river 48 feet and 6 inches above low-water mark or 7 feet and 2 inches above the danger-line. Great suffering among the people who were compelled to vacate their homes. Each additional rise of but one inch drove many people from their houses; over 300 families now homeless. 16th, river 48 feet and 10 inches above low-water mark, or 7 feet and 6 inches above the danger-line, and 5 feet 1 inch below the high-water mark of 1847. Many additional houses submerged and families left homeless. 17th, 6 a. m., river 49 feet and 11 inches above low-water mark, or 8 feet and 7 inches above the danger-line; 9 p. m., 50 feet and 11 inches, or 9 feet and 7 inches above the danger-line and 4 feet and 8 inches below the high-water mark of 1847. All communication cut off from the pikes leading into the city; great suffering in the flooded district. 18th, 6 a. m., river 51 feet and 2 inches above low-water mark, or 9 feet and 10 inches above the danger-line and 4 feet and 5 inches below the high-water mark of 1847; 2.21 p. m., river stationary. During the afternoon and evening another heavy rain occurred, when the river began to rise again. 19th, river 51 feet and 7 inches and still rising; 1.21 p. m., 51 feet and 11 inches; 9 p. m., 52 feet and 4 inches; over 500 families now homeless and the consequent suffering extreme; 10 p. m., river 53 feet and 4 inches above low-water mark, or 12 feet above the danger-line and 2 feet and 3 inches below the high-water mark of 1847. Although the river did not reach the highest point on the gauge as recorded in 1847, the volume of water was considerably greater. 20th, 6 a. m., river 52 feet and 5 inches, or a fall of 11 inches in the past eight hours. All communication on streets leading out to North Nashville completely cut off; 9 p. m., communication with East Nashville entirely cut off and all railroad travel suspended except on the Louisville and Nashville Railroad and the Chattanooga and Saint Louis Railroad. All other railroads in southern part of State submerged and unserviceable; midnight, river again rising rapidly, heavy rains still continue at intervals. 21st, 6 a. m., 52 feet and 11 inches; 1.21 p. m., 53 feet and 11 inches; 9 p. m., 53 feet and 9 inches. Many valuable rafts of pine and walnut were swept from the various lumber yards in the city. More than one-fifth of the population of the city have been compelled to move from their homes and places of business. Over 500 houses now under water. 22d, river 54 feet and 7 inches above low-water mark, or 13 feet and 3 inches above the danger-line, and 1 inch above the great rise of 1847. Communication with North Nashville now entirely cut off and water 3 feet deep on North College street. 23d, 6 a. m., 54 feet and 2 inches; 9 p. m., 53 feet and 6 inches; river fell slowly throughout the day. Many small houses floated down the river during the past two days. 24th, 1.21 p. m., river 52 feet and 11 inches and slowly falling. 25th, 1.21 p. m., river 53 feet and 9 inches. 27th, 1.21 p. m., river 50 feet and 4 inches. 28th, 1.21 p. m., river 49 feet and 11 inches. 29th, 1.21 p. m., river 50 feet and 1 inch. 30th, 1.21 p. m., river 49 feet and 4 inches. 31st, river falling rapidly. The estimated loss of property in and about the city of Nashville resulting from the overflow of the Cumberland is placed at fully $400,000. Many farms in the surrounding country were entirely flooded, and the spring wheat crop will prove a complete failure. The entire river from its mouth to the head of navigation was above banks and continued above the danger-line for nineteen days. For many miles around the entire country was flooded and all railroad and other travel suspended. The following is a comparative record of the highest water at Nashville for a period of several years: 1826, April, over 50 feet (?); 1847, March 18th, 54 feet 6 inches; 1862, January, 50 feet 3 inches; 1867, March, 51 feet 1 inch; 1872, April 15th, 46 feet 3 inches; 1873, February 21st and 22d; 39 feet; 1874, April 16th and 17th, 49 feet 2 inches; 1875, March 2d, 41 feet 4 inches; 1876, January 29th, 4 feet 6 inches; 1877, January 22d, 40 feet 4 inches; 1878, April 26th, 27 feet 3 inches; 1879, January 19th, 41 feet 4 inches; 1880, March 17th, 46 feet 5 inches; 1881, January 24th and 25th, 33 feet; 1882, January 22d, 54 feet 7 inches. Johnsonville, 21st, river nine miles wide and rising rapidly; lowlands flooded. 25th, water reached the iron rails of the railroad-bridge; houses, logs, lumber, and *débris* of all kinds floating down the river in large quantities. The population, numbering about 700, were driven from their homes, and the entire settlement was submerged. Camden, 21st, lowlands submerged to a depth of about 5 feet; water rose 26 inches in past twenty-four hours. Pulaski, 20th, Richland River and other streams overflowed. Great damage throughout the country; much farm property destroyed and several villages inundated. Danville, 20th, Tennessee River overflowed, carrying away the bridge of the Louisville and Memphis Railroad. Burnside, 21st, river 35 feet above low-water mark, and rising at the rate of 18 inches per hour. Clarksville, 20th, river overflowed; all houses on Front street flooded, some to a depth of three feet. Water-works surrounded, the boilers submerged, and all operations ceased. Much inconvenience and considerable loss has been experienced by mills and factories. On each side of Tennessee River, for a distance of several miles, water covered railroad tracks to a depth of three feet. In many warehouses water from two to five feet deep. River within 20 inches of the great flood of 1847. Cumberland City, 20th, railroad track 20 inches under water; all trains between this point and Paris, 65 miles distant, abandoned. Memphis, 15th, occasional drift in river. 16th, river overflowed opposite the city. 21st to 25th, heavy drift in river. 25th, river rising rapidly and now 34 feet 2 inches above low-water mark. 26th, river 34 feet and 4 inches above low-water mark, and 4 inches above the danger-line. Track of the Memphis and Little Rock Railroad partly submerged. 27th, river 34 feet and 7 inches above the low-water mark, and 7 inches above the danger-line, with occasional drift. Wolfe River rising rapidly and moving with a powerful current. 28th, river 34 feet and 9 inches above low-water mark and 9 inches above the danger-line; much drift in river. 29th, intervening country between station and Marion, Crittenden County, Ark., almost entirely submerged. At the latter place water five inches higher than ever before recorded; water running through the streets; many houses flooded and others surrounded. 31st, river 34 feet and 11 inches above low-water mark and 11 inches above the danger-line. Memphis and Little Rock Railroad entirely submerged; passengers and baggage transported by aid of boats. Columbia, 21st, river has been subject to a series of heavy rises since the opening of the year. Much damage sustained by farmers along the line of the river, from the flooding of fields and the washing away of fences and other property. Knoxville, 17th, river higher than for many years past. Heavy land-slides occurred on the East Tennessee, Virginia and Georgia Railroad. 28th, water in First Creek higher than ever before known. In the flats east of the city many dwellings flooded and a large amount of property surrounded by water. Chattanooga, 18th, river above the danger-line and lower portions of the city submerged. 19th, river rising. 29th, river falling.

High tides.—Delaware Breakwater, 18th, 19th, Indianola, 22d, 26th.

Low tides.—New Haven, 22d, very low; Newport, 23d, unusually low, water about 3 feet below mean low tide. Between Camden and Philadelphia, 23d, high winds caused lowest water on the Delaware ever known before; several ferry-boats ran aground on the bar, and other boats on the lower end of Windmill Island. New York, 24th, heavy northwest gale caused extremely low tide.

Waterspouts.—Warren County, Tenn., 27th, p. m., near the head waters of Caney Creek, one of the main tributaries of the Cumberland River.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of chart of No. III. Owing to the presence of ice or the breakage of instruments observations are wanting as follows: Alpena, 1st to 31st; Burlington, Vt., 23d to 31st; Escanaba, 2d to 31st; Buffalo, 4th to 7th, 22d to 26th, 29th to 31st; Cleveland, 22d to 24th, 27th to 31st; Duluth, 4th to 7th, 10th, 17th, 20th, 22d to 31st; Detroit, 2d to 31st; Chicago 3d to 7th, 15th to 26th, 30th, 31st; Grand Haven, 4th to 9th, 14th to 31st; Marquette, 3d to 7th, 17th to 25th; Milwaukee, 4th to 31st; Sandusky, 1st to 11th, 14th to 31st; Toledo, 1st to 31st.

ATMOSPHERIC ELECTRICITY.

Auroras.—The most remarkable display of the month, because of the continuity of the line of observation and the numerous points at which the phenomenon was noted, was that of the 19th, the following stations reporting: Charlottetown, Prince Edward Island, during the evening. Halifax, N. S., p. m. Saint John's, N. B., during the evening. Fredericton, N. B., 9 p. m. Eastport, 8 p. m. to midnight; arch formed at 8.30 p. m.; 10 p. m., very brilliant, of a red, greenish tinge, dark segment below; had a wavy lateral motion from east to west. Portland, 7.30 p. m., arch extending over the entire northeastern portion of the heavens; was of a deep straw color. Mount Washington, 7 p. m. to morning of the 20th; faint yellowish light extending from NW. to ENE. Burlington, Vt., 7 to 11.45 p. m., diffuse white light in the form of an arch; dark segment below, but not well defined. Thatcher's Island, 8 p. m. to midnight; bright streak of bluish white light in northern heavens; altitude 25° and azimuth 90°. New London, 7 to 9.30 p. m., arch well defined; altitude 20° and azimuth 15° E. to 10° W. New Shoreham, 9.15 p. m., faint arch of light; altitude 20°. Newport, 7.20 to 11.33 p. m., unusually brilliant; arch well defined from 8 to 8.50 p. m.; altitude 12° to 15° and azimuth 90°; center of arch, bright white, with upper and lower edges tinged with red; arch reappeared at 9.30 p. m.; numerous beams rose out of the dark segment and were very bright at points where they intersected the arch. Bangor, Me., 7 p. m. to morning of 20th; during the early morning the display became very brilliant; a dense band of leaden-hued clouds darkened the northern horizon; from behind the cloud bank, broad bands of the softest light streamed toward the zenith and encircled the northern sky in a gorgeous halo; disappeared only at the approach of day. New Haven, 9 p. m., very brilliant. Point Judith, R. I., 7 p. m. to morning of 20th, very brilliant. Springfield, Mass., 7 p. m. to morning of 20th, extended along the northern horizon in a direction from NNW. to ENE., altitude about 15°; dark segment below arch and well defined, being a prominent feature of the display; 9.45 p. m, several streamers shot upward near the eastern end of the arch, and later at other portions, with at times a wavy lateral motion; light constantly changing in brightness and extent of surface; at times there were two irregular parallel bands of light extending horizontally above the dark segment, separated from each other by a dark band about the density of the dark segment below the arch; after 10 p. m. the light began to fade, and the dark segment decreased rapidly in size. Agawam, Mass., 7.30 to 10 p. m., probably covered about half the northern horizon, breadth of band about 20°; no streamers. Cornish, Me., from dark to morning of 20th. Gardiner, Me., 6 p. m. to morning of 20th. Dexter, Me., visible most of night; very brilliant. Contoocookville, N. H., 9 to 10 p. m., bright arch, with dark segment below. Newport, Vt., 7 to 10 p. m. Woodstock, Vt., 8 to 9 p. m., extended across northern sky; altitude about 30°. Cambridge, Mass., 6 p. m., over dark sky; rather bright all the evening. Westborough, Mass., very brilliant. Williamstown, Mass., 7.30 p. m., bright arch, with small faint streamers above and dark segment below. Fall River, Mass., broad band in northwestern sky, extending half way to the zenith; numerous streamers. Boston, 7 p. m., till after midnight, very brilliant. South Lee, Mass., 8 p. m., bright arch, with numerous streamers. Southington, Conn., 9 p. m., bright arch, with streamers. Madison Barracks, N. Y., 7. p. m. Ardenia, N. Y., 9 to 11 p. m., very brilliant. Brookhaven, N. Y., 8 to 10.30 p. m., very brilliant. Ithaca, N. Y., 8 to 11 p. m., bright arch, sharply defined with dark segment below; 10 p. m., two arches formed, were sharply defined, but quite irregular; at times the light seemed to concentrate in masses, resting on the dark segment, and again streamers shot upward to a height of 30°, with a lateral motion from west to east. North Volney, N. Y., 10.15 p. m. Palermo, N. Y., 9 p. m. Rochester, 8 to 11.15 p. m., horizontal bands of light, no dark segment below. Oswego, 7.30 p. m. to 2.30 a. m. of 20th, bright arch of light with streamers occasionally shooting to zenith; display constantly changing color from a reddish to a pale yellow. Atco, N. J., low bright arch, dark segment below, but no streamers. Somerville, N. J., 9 to 10.30 p. m., bright arch with streamers. Freehold, N. J., 7.30 to 9 p. m. Moorestown, N. J., 9 p. m., low distinct arch, no streamers. Princeton, N. J., during evening. Dyberry, Pa., 8 p. m., bright arch. Great Falls, Md., 9.15 to 10.15 p. m., bright arch with streamers. Toronto, during evening. Port Huron, 6 to 11.30 p. m., diffuse light, altitude 30°. Bellefontaine, Ohio, 9 p. m., bright arch, with dark segment below. North Lewisburgh, Ohio, 8 p. m., long low arch. Ruggles, Ohio, 8 to 9 p. m., diffuse light. New Corydon, Ind., 8 to 10 p. m., bright arch. Lansing, Mich., during evening. Riley, Ill., 7.20 to 10.30 p. m., bright arch, altitude 14°. Elmira, Ill., 9 p. m., faint bluish light, with streamers. Morrison, Ill., during evening. Dubuque, 7.10 to 10.30 p. m., very brilliant, altitude 30°; extended from N. 20° W. to N. 30° E. Beloit, Wis., during evening. Franklin, Wis., during evening. La Crosse, 8.30 p. m. to 4 a. m. of 20th. Saint Paul, 9 to 11.30 p. m., bright arch of pale yellow, altitude from 10° to 15°, no streamers. Northfield, Minn., 6 p. m. to 6 a. m. of 20th. Guttenburgh, Iowa, 7 to 10 p. m. Clinton, Iowa, during evening, bright arch, altitude 20°, no streamers. Cresco, Iowa, 7 to 10.30 p. m., diffuse light extending from NNW. to ENE. Monticello, Iowa, during evening. Des Moines, 7 p. m., bright arch with dark segment below. Moorhead, Minn., 8 to 11 p. m., bright arch of pale yellow. Bismarck, 6 p. m. to morning of 20th. Rapid City, Dak., 7 to 10.30 p. m. Fort Meade, Dak., during evening. The next most important display was that of the 14th, the line of observation extending eastward from Cape Breton Island to Dakota, the following stations reporting: Charlottetown, P. E. Island, during evening. Fredericton, N. B., during evening. Eastport, 11.30 p. m. to midnight; diffuse light. Newport, R. I., 10.15 p. m. to morning of 20th, diffuse light; a few streamers rose to an altitude of 15° or 20°, but lasted only a few moments. Burlington, Vt., 11 to 11.45 p. m., bright arch with streamers reaching an altitude of 25°; no dark segment. Cambridge, Mass., 7.30 to 10.30 p. m. Southington, Conn., 9 p. m., faint light low down upon the horizon. Waterburgh, N. Y., 9.30 p. m. Rochester, 10 to 11 p. m., faint light. Toronto, during evening. Lansing, Mich., during evening. Clear Creek, Nebr., 9 p. m., faint light. Saint Vincent, 7 to 11 p. m., very brilliant, with two arches; light frequently reached the zenith; forks of light characteristic of merry dancers extended along both arches; they increased in brilliancy on the western quarter of the arches and gradually faded away as they approached the eastern quarter. The following, with the exception of the 11th, were local displays: Fredericton, N. B., 15th. Saint John, N. B., 15th. Eastport, 15th, 8.30 to 9.10 p. m., bright arch with several streamers, some of which shot upward to a height of 30°. Contoocookville, N. H., 11th, diffuse light. Thatcher's Island, 15th, 7 to 7.10 p. m., faint light. Cambridge, Mass., 11th, aurora suspected at 9.30 p. m., and at 11 p. m. a broken arch with a few streamers became visible. Southington, Conn., 11th, 9 p. m., faint light. Atco, N. J., 24th, 8 p. m., two faint arches resembling a double rainbow; no dark segment. Gardiner, Me., 11th, 8.30 p. m. to 12.30 a. m. of the 12th; 30th, 4.30 a. m. Dexter, Me., 12th. Waterburgh, N. Y., 11th. Catawissa, Pa., 22d. Toronto, 11th. Rochester, 11th, 9 to 11.30 p. m., diffuse light. New Corydon, Ind., 23d, 6 p. m. to 2.30 a. m. of the 24th, three well-defined arches, altitude 30°; 24th, from early evening to morning of 25th. Lansing, Mich., 11th, during evening. Northport, Mich., 11th, 9 p. m. Alpena, 11th, 8.30 p. m. to 12.40 a. m. of 12th, diffuse light with a few streamers occasionally reaching near zenith. Grand Haven, 11th, 10 p. m. to 1.30 a. m. of 12th, resembling morning dawn. Beloit, Wis., 11th, during evening. Franklin, Wis., 11th, during evening. Cresco, Iowa, 11th, 8.30 to 9.30 p. m., faint light. Northfield, Minn., 11th, 9.15 to 10.20 p. m., bright streamers occasionally reaching an altitude of 45°. Cedar Rapids, Iowa, 13th; Clear Creek, Nebr., 1st, faint light. Saint Vincent, 10th, 8 to 11 p. m., diffuse light with a slight lateral motion; 23d, 7 to 11 p. m., faint light. Phelps, N. Y., 21st, bright arch of bluish white, altitude about 23° with an azimuth of over 110°; this condition remained intact for about two hours, when the arch broke into a number of large beams, having a slow but uniform motion eastward; light sufficiently brilliant to cast distinct shadows upon the snow.

Zodiacal light.—Nashville, 9th, 11th, 14th; Saint Vincent, Minn., 9th; Springfield, Ill., 14th; Dayton, Wash., 17th, 18th, 20th; Rio Vista, Cal., 16th to 20th; New Corydon, Ind., 9th, 14th, 17th, 19th; Clinton, Iowa, 9th, 11th, 13th, 14th, 16th, 17th; Cresco, Iowa, 8th, 11th, 14th, 16th, 18th, 19th, 21st, 22d; Monticello, Iowa, 9th, 10th, 13th, 14th, 16th, 17th, 18th, 21st; Yates Center, Kans., 15th, 17th, 18th, 21st, 22d; Cambridge, Mass., 7th, 9th, 11th, 12th, 14th, 15th, 17th, 19th, 22d, 27th; Rowe, Mass., 19th; Clear Creek, Nebr., 8th, 10th, 11th, 13th, 14th, 16th to 21st; Bellefontaine, Ohio, 14th; Stateburgh, S. C., 15th, 16th; Wytheville, Va., 14th; Franklin, Wis., 11th, 12th, 13th.

Thunder-storms.—They were reported in the various districts as follows: Middle Atlantic States, Fallston, Md., 16th; South Atlantic States, 1st, 21st, 28th; East Gulf States, 8th, 10th, 13th, 27th, 28th; West Gulf States, 13th, 27th; Tennessee, Ashwood, 12th; Ohio Valley, 2d, 6th, 7th; Upper Lake region, 8th, 26th; Upper Mississippi Valley, 2d, 6th, 7th, 8th, 26th; Lower Missouri Valley, 6th, 7th, 8th, 10th, 12th, 13th; Southern Slope, Jacksborough, Tex., 16th, 27th; Pacific Coast, San Diego, 12th, Red Bluff, 23d; San Francisco, 24th.

Atmospheric electricity interfering with telegraphic communication.—Bismarck, Dak., 19th, sufficiently strong so that telegraph operator was able to work an open wire without the aid of battery. The current was so violent that it scorched the rubber covering of the wires and filled the room with the stench of burning compound. In placing the ends of the positive and negative wires together, a bright light about the size of a large shirt button was created, which, rapidly revolving between the butts, illuminated the office.

OPTICAL PHENOMENA.

Solar halos have been observed in the various districts on the following dates: New England, 1st, 5th, 10th, 12th, 16th, 18th, 20th, 21st, 28th, 31st; Middle Atlantic States, 1st, 4th, 10th, 12th, 15th, 16th, 19th, 27th, 30th; South Atlantic States, Hatteras, 21st; East Gulf States, Pensacola, 19th, 23d; West Gulf States, Little Rock, 14th; Rio Grande Valley, Eagle Pass, 3d; Ohio Valley and Tennessee, 1st, 9th, 11th, 14th, 15th, 17th, 19th, 23d, 24th, 27th, 29th, 30th, and 31st; Lower Lake region, 12th, 15th, 18th, 25th; Upper Lake region, 3d, 4th, 5th, 12th, 14th, 16th, 18th, 19th, 23d, 24th, 27th, 28th; Extreme Northwest, Moorhead, Minn., 20th; Upper Mississippi Valley, 1st to 6th, 9th, 11th, 12th, 13th, 14th, 15th, 16th, 17th, 18th, 19th, 23d, 26th, 27th, 28th, 29th, 30th; Missouri Valley, 2d, 11th, 12th, 13th, 14th, 17th, 19th, 27th to 30th; Northern Slope, Rapid City, Dak., 3d; Deadwood, 27th, and North Platte, 29th; Middle Slope, 19th, 23d, 25th, 28th, 29th; Southern Plateau, Florence, Ariz., 4th, 7th; Middle Plateau, Pioche, 18th; Salt Lake City, 18th, 22d; Pacific Coast regions, San Francisco, 3d, 9th, 11th, 15th, 22d, 28th; Poway, Cal., 27th; Sacramento, 22d; San Diego, 7th, 27th; Eola, Oreg., 29th.

Lunar halos have been observed in the various districts on the following dates: New England, 1st, 3d, 4th, 7th, 18th, 22d, 24th, 25th, 27th, 31st; Middle Atlantic States, 2d to 5th, 10th, 12th, 14th, 15th, 22d, 23d, 24th, 26th to 31st; South Atlantic States, 1st, 4th, 5th, 6th, 23d, 24th, 25th, 27th, 28th, 29th; Florida Peninsula, Key West, 24th; East Gulf States, 3d to 6th, 23d, 26th, 27th, 28th; West Gulf States, 1st to 4th, 6th, 9th, 25th to 28th, 31st; Rio Grande Valley, 2d, 3d, 4th; Ohio Valley and Tennessee, 1st, 3d, 6th, 12th, 23d, 24th, 26th, 27th, 28th, 29th, 30th, 31st; Lower Lake region, 4th, 5th, 7th, 10th, 12th, 24th, 27th, 28th, 29th, 31st; Upper Lake region, 1st to 5th, 8th, 9th, 10th, 14th, 15th, 19th, 23d, 27th, 29th, 30th, 31st; Extreme Northwest, 2d, 3d, 10th, 30th; Upper Mississippi Valley, 2d, 3d, 6th, 8th, 9th, 12th, 13th, 23d, 26th to 31st; Missouri Valley, 1st, 2d, 3d, 10th, 12th, 22d, 23d, 25th to 29th, 31st; Northern Slope, 1st, 4th, 11th, 13th, 22d, 23d, 25th, 26th, 29th, 31st; Middle Slope, 1st to 7th, 10th, 24th, 25th, 27th, 28th, 29th; Southern Plateau, 2d to 6th, 27th to 31st; Middle Plateau, 1st, 3d, 4th, 5th, 24th, 26th, 29th, 30th; Northern Plateau, 24th, 29th, 30th, 31st; North Pacific Coast, 11th, 29th, 31st; Middle Pacific Coast, 5th, 11th, 22d, 27th, 30th; South Pacific Coast, Yuma, 2d, 5th, 13th, 28th; Poway, Cal., 27th. Exceptionally brilliant displays were observed at Pioche, Nev., on the 3d, from 7 p. m. to midnight, and at Council Bluffs, Iowa, on the 31st, from about 8 to 11 p. m. The parhelic circle with the accompanying paraselenæ was present in both instances.

Mirage.—Indianola, 1st, 10th, 18th, 19th, 21st, 31st. Huron, Dak., 11th, a. m., on the eastern horizon, making the town of Iroquois, 22 miles distant, visible through the telescope; houses, barns, haystacks, etc., were distinctly seen. The phenomenon lasted 55 minutes. 31st, 7.30 to 8.30 a. m., mirage making objects 30 miles distant visible to the naked eye; with the aid of a telescope small trees could be distinguished in the gulches of the Wessington Hills, 30 miles distant. Council Grove, Kans., 11th, 17th, 31st. Northport, Mich., 29th.

MISCELLANEOUS PHENOMENA.

Sunsets.—The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from 187 stations show 5,756 observations to have been made, of which 34 were reported doubtful; of the remainder 5,722, or 83.3 per cent., were followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

Date—Jan., 1882.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.
2, 2 p. m	0	0	....	....	0	0	2	15
3, 10 a. m	0	0	0	0	0	0	2	15
5, 11 a. m	1	5	0	0	0	0	3	‡20
7, 12 m	0	0	1	5	0	0	2	15
9, 3 p. m	1	5	0	5	1	5	3	15
10, 11 a. m	1	2	0	5	1	2	4	12
12, 9 a. m	1	8	1	4	1	4	4	16
14, 9 a. m	0	6	0	2	0	6	4	20
15, 10 a. m	0	4	0	0	0	0	3	20
17, 1 p. m	1	2	1	8	0	0	3	12
18, 10 a. m	1	6	0	0	1	2	4	18
19, 12 m	1	2	0	0	0	0	5	20
22, 12 m	1	9	....	....	....	....	4	12
23, 1 p. m	1	2	0	2	1	1	4	12
24, 12 m	1	1	1	2	1	1	4	11
27, 10 a. m	1	8	....	....	....	....	4	‡20
29, 12 m	0	5	0	0	0	0	4	‡25
30, 2 p. m	0	0	0	5	0	0	4	‡20

‡Approximated. Faculæ were seen at the time of every observation.

Mr. William Dawson, at Spiceland, Ind., reports: 9th, 3 groups, 6 spots, 2 spots at east edge, 2 at west, and 2 north of center; air very poor; power 36. 14th, 4 groups, 23 spots; air poor; power 50. 17th, 3 groups, 5 spots; air poor; power 50. 27th, 4 groups, 30 spots, one large spot near east and another near west edge; air tolerably good; power 100. 30th, 5 groups, 57 spots; air good; power 100. Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: Sun spots were observed on 2d, 9th, 14th, 17th, 22d, 23d, 24th, 27th, 30th, or on every clear day during the month; they were least numerous on the 9th and largest on the 30th. The following record of observations has been forwarded by Mr. A. G. Bender, Sacramento, Cal.: 6th, 12 m., 1 group, 10 spots. 7th, 12 m., 1 group, 7 spots. 8th, 12 m., 1 group, 6 spots. 9th, 12 m., 1 group, 2 spots; 1 group and 6 spots disappeared by solar rotation. 10th, 12 m., 1 group, 2 spots; filmy clouds probably prevented the observation of some of the smaller spots. 11th, 12 m., 3 groups and 8 spots; 2 groups and 5 spots new. 12th, 12 m., 3 groups, 8 spots. 13th, 12 m., 3 groups, 6 spots. 14th, 12 m., 2 groups, 10 spots; 1 group disappeared. 16th, 12 m., 2 groups, 8 spots; 2 spots disappeared. 17th, 12 m., 2 groups, 4 spots; 2 groups, each with 1 large and 10 small spots. 18th, 12 m., 2 groups, 4 spots. 19th, 12 m., 1 new group and 2 spots; 1 group and 2 spots disappeared by solar rotation; both spots in new group large and near together. 20th, 12 m., 2 groups and 2 spots. 21st, 12 m., 3 groups and 8 spots; 1 group and 3 spots new. 24th, 12 m., 3 groups and 4 spots; 1 group and 2 spots new, and the same number of each disappeared by solar rotation. 25th, 12 m., 5 groups and 10 spots; 2 groups and 2 spots new. 27th, 11 a. m., 21 groups and 4 spots; 10 groups new and 2 groups disappeared by solar rotation. 28th, 11 a. m., 6 groups and 17 spots; 2 groups and 13 spots new. 29th, 11 a. m., 6 groups and 16 spots. 30th, 12 m., 7 groups and 21 spots.

The following statement shows the summarized precipitation for the twelve months ending June 30, 1881, at the various stations of the Central Pacific Railroad, furnished through the courtesy of its chief engineer, Mr. S. S. Montague: San Francisco, 29.89 inches; Oakland, 20.79; Niles, 20; Pleasanton, 19.57; Livermore, 16.45; Tracy, 10.68; Lathrop, 13.34; Stockton, 15.31; Galt, 15.93; Brighton, 13.63; Sacramento, 22.14; Rocklin, 21.32; Auburn, 37.42; Colfax, 48.14; Alta, 50.97; Emigrant Gap, 62.26; Cisco, 82.71; Summit, 66.39; Truckee, 21.97; Boca, 15.80; Reno, 5.74; Wadsworth, 4.23; Hot Springs, 2.95; Brown's, 3.38; Humboldt, 5.52; Winnemucca, 10.18; Golconda, 4.92; Battle Mountain, 607; Beowawe, 6.26; Palisade, 10.61; Carlin, 10.35; Elko, 5.35; Halleck, 4.64; Wells, 3.97; Otego, 5.35; Toano, 2.34; Tecoma, 2.62; Terrace, 424; Kelton, 5.03; Promontory, 2.93; Blue Creek, 12.01; Corinne, 14.57; Ogden, 11.55; Marysville, 17.43; Chico, 17.62; Tehama, 10.40; Red Bluff, 28.95; Redding, 50.77; Modesto, 8.40; Turlock, 9.05; Merced, 11.59; Borden, 10.68; Fresno, 8.22; Kingsburgh, 9.49; Martinez, 19.66; Dunnigan, 19.65; Williams, 15; Willows, 13.67; Antioch, 17.39; Brentwood, 12.49; Byron, 16.05; South Vallejo, 21.98; Napa, 28.19; Calistoga, 40.48; Suison, 24.52; Davis, 18.55; Woodland, 18.54; Knight's Landing, 17.96; San Mateo, 21.09; Menlo Park, 18.36; San José, 12.46; Tennant's, 24.81; Gilroy, 23.42; Hollister, 12.48; Pajaro, 19.91; Salinas, 12.48; Soledad, 6.78; Monterey, 13.91; Santa Cruz, 29.64; Lemoore, 8.59; Visalia, 10.65; Goshen, 9.69; Tulare, 9.98; Delano, 6.75; Sumner, 3.59; Caliente, 9.80; Keene, 11.12; Tehachipi, 8.16; Mohave, 1.27; Ravena, 5.40; Newhall, 9.15; San Fernando, 9.45; Los Angeles, 10; Spadra, 10.22; Colton, 6.08; Whitewater, 4.69; Indio, 1.20; Mammoth Tank, 1.82; Yuma, 1.29; Texas Hill, 1.52; Maricopa, 0.88; Pantano, 1.25; Ione, 17.26; Farmington, 13.20; Anaheim, 7.08; Petaluma, 23.29.

Meteors.—Des Moines, Iowa, 18th; Davenport, Iowa, 22d; Helena, Mont., 15th; North Platte, Nebr., 16th, 6.20 p. m., meteor of unusual size shot from a point near the zenith towards the western horizon and bursted at an altitude of about 30°, casting a beautiful cluster of incandescent points of light in every direction. Yuma, Ariz., 5th, 9th, 17th; Rio Vista, Cal., 20th; Monticello, Iowa, 17th, 22d; Dexter, Me., 7th; Woodstock, Md., 11th, 14th, 24th; Clear Creek, Nebr., 8th, 10th, 11th, 13th, 14th, 16th to 19th, 21st; Atco, N. J., 9th, 14th, 22d; Stateburgh, S. C., 14th; Flemington, W. Va., 30th.

Migration of birds.—Geese flying northward: Augusta, 14th; Shreveport, 12th; De Soto, Nebr., 5th. Flying southward: Laconia, Ind., 21st; Cairo, Ill., 28th, 29th; Portland, Oreg., 20th; Sacramento, Cal., 5th, 6th, 8th; Indianola, 6th, 10th. Ducks flying northward: Charleston, Ill., 2d, 26th; Shreveport, 30, Yates Center, Kans., 9th. Flying southward: Port Huron, 5th.

Polar bands.—Baltimore, Md., 27th; Pensacola, Fla., 27th; Nashville, 2d; Florence, Ariz., 23d, 26th; Prescott, Ariz., 13th; New Corydon, Ind., 3d, 9th, 17th, 18th, 24th, 27th, 30th; Auburn, N. H., 30th; Freehold, N. J., 9th, 29th; Vineland, N. J., 13th, 15th; Waterburgh, N. Y., 19th; Woodstock, Vt., 25th; Wytheville, Va., 3d, 11th, 22d, 23d, 24th.

Earthquakes.—Cape Lookout, N. C., 8th, 5.10 p. m., shock of about ten seconds duration; house forcibly shaken, jarring windows and doors. Centerville, Cal., 26th, two severe shocks.

Prairie and forest fires.—Yankton, Dak., 6th to 9th, 23d, 24th; Fort Gibson, Ind. T., 5th, 7th, 24th.

Sand-storms.—Fort Verde, 11th; Yuma, 7th, 11th.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

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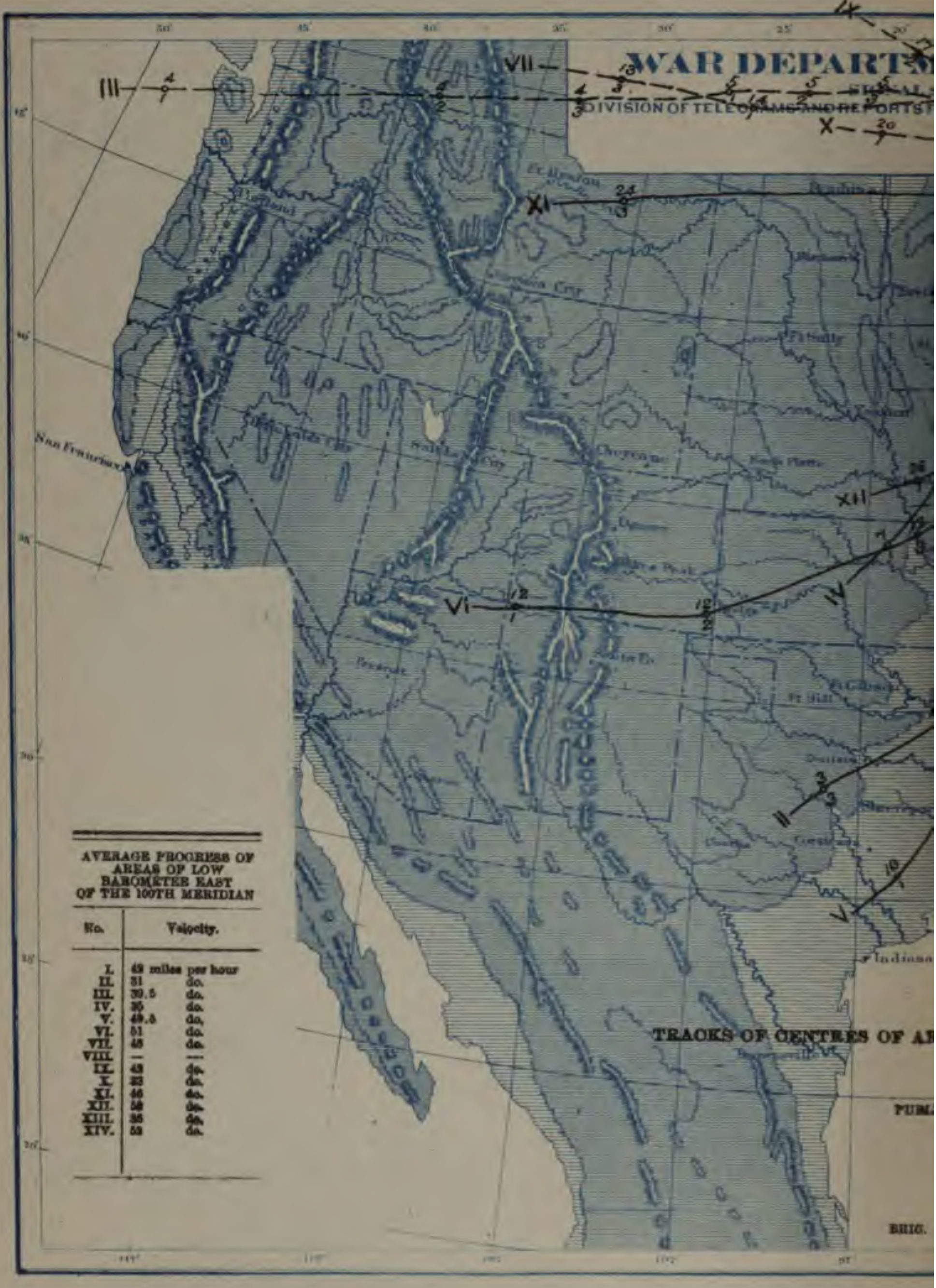
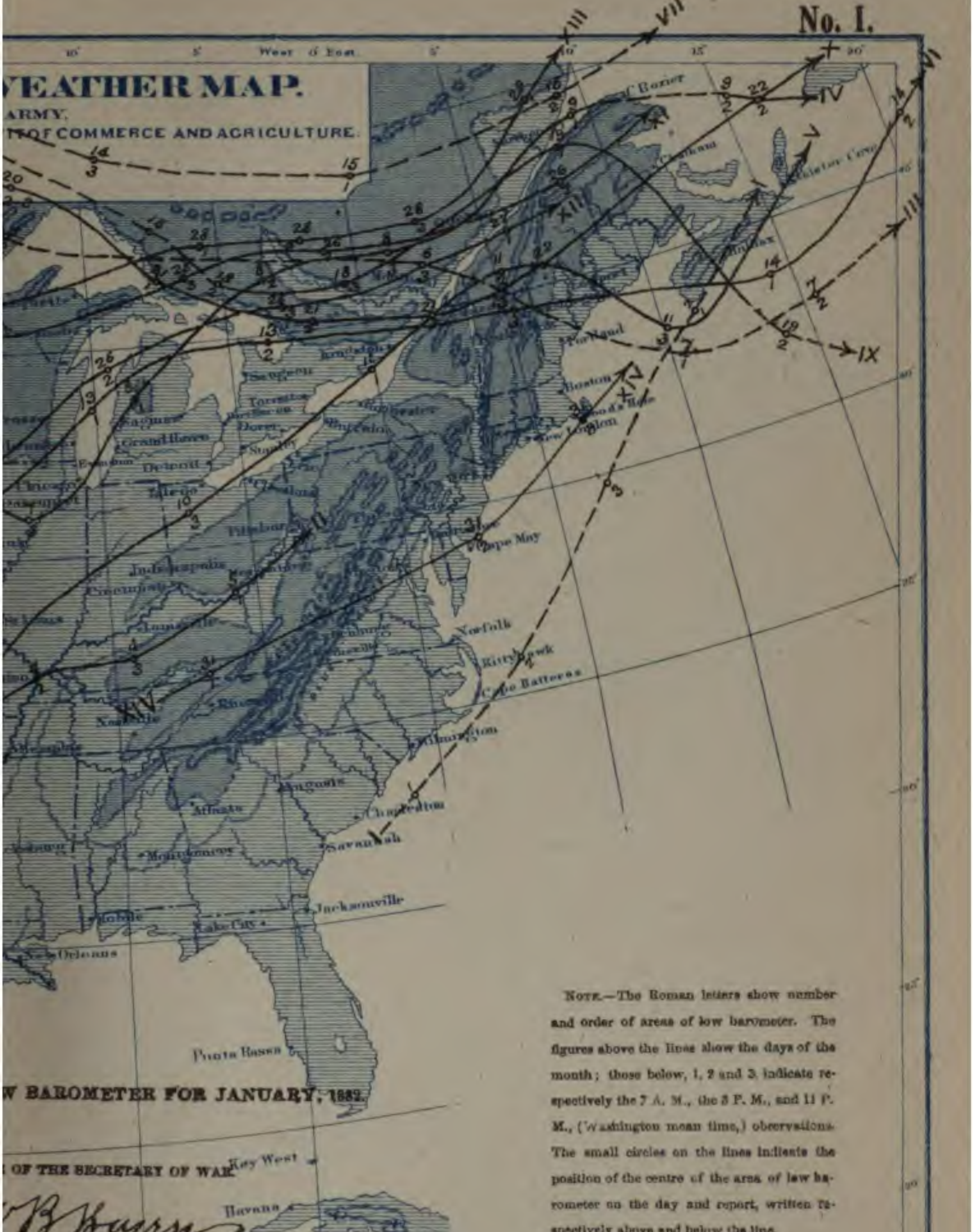


AVERAGE PROGRESS OF AREAS OF LOW BAROMETER EAST OF THE 100TH MERIDIAN

No.	Velocity.	
I.	43 miles	per hour
II.	31	do.
III.	39.5	do.
IV.	36	do.
V.	49.5	do.
VI.	51	do.
VII.	45	do.
VIII.	—	—
IX.	43	do.
X.	23	do.
XI.	46	do.
XII.	56	do.
XIII.	35	do.
XIV.	53	do.

No. I.



VEATHER MAP.

ARMY.

TOF COMMERCE AND AGRICULTURE.

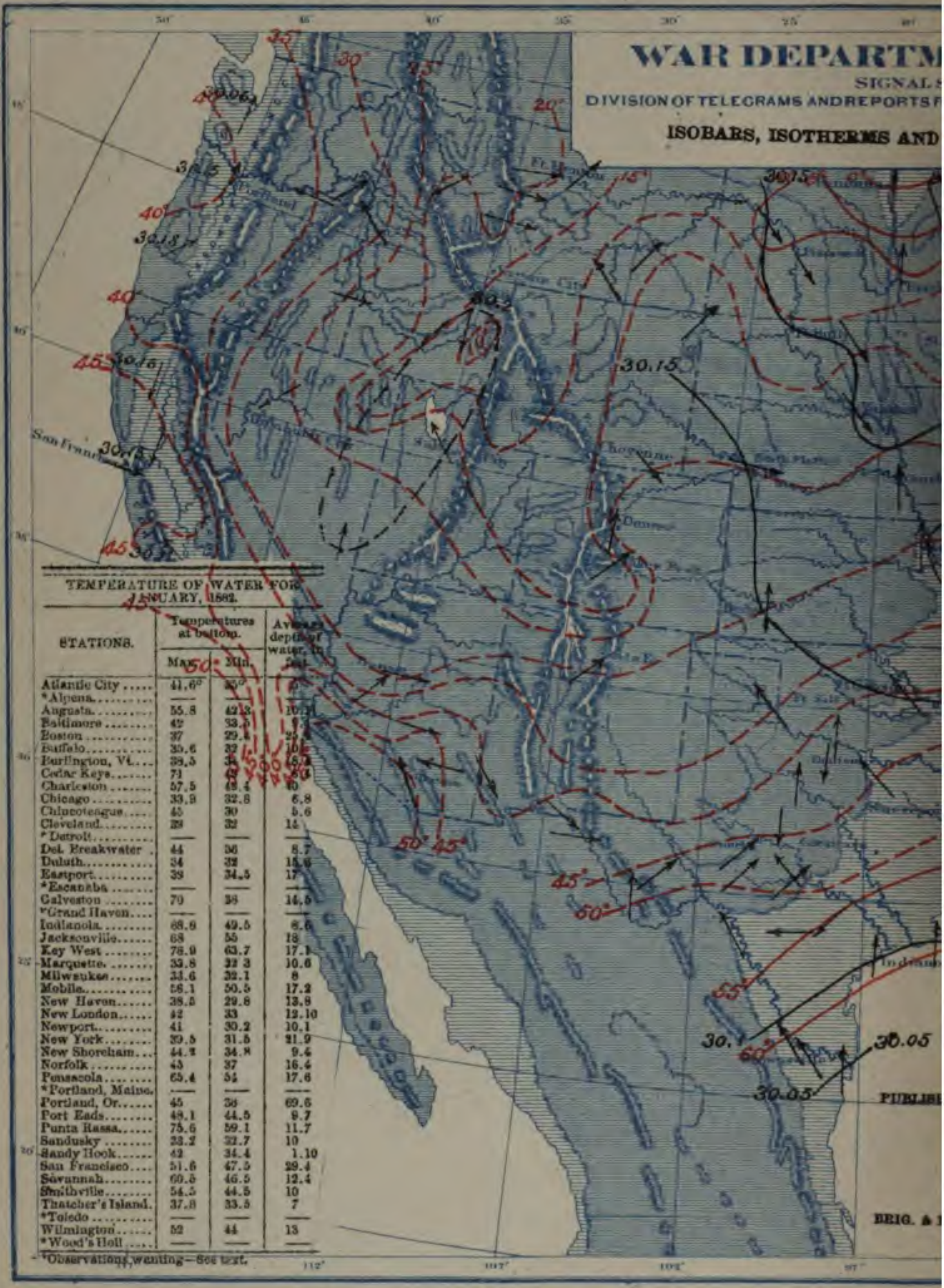
W BAROMETER FOR JANUARY, 1882.

OF THE SECRETARY OF WAR.

B. Hazen

, CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 3 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

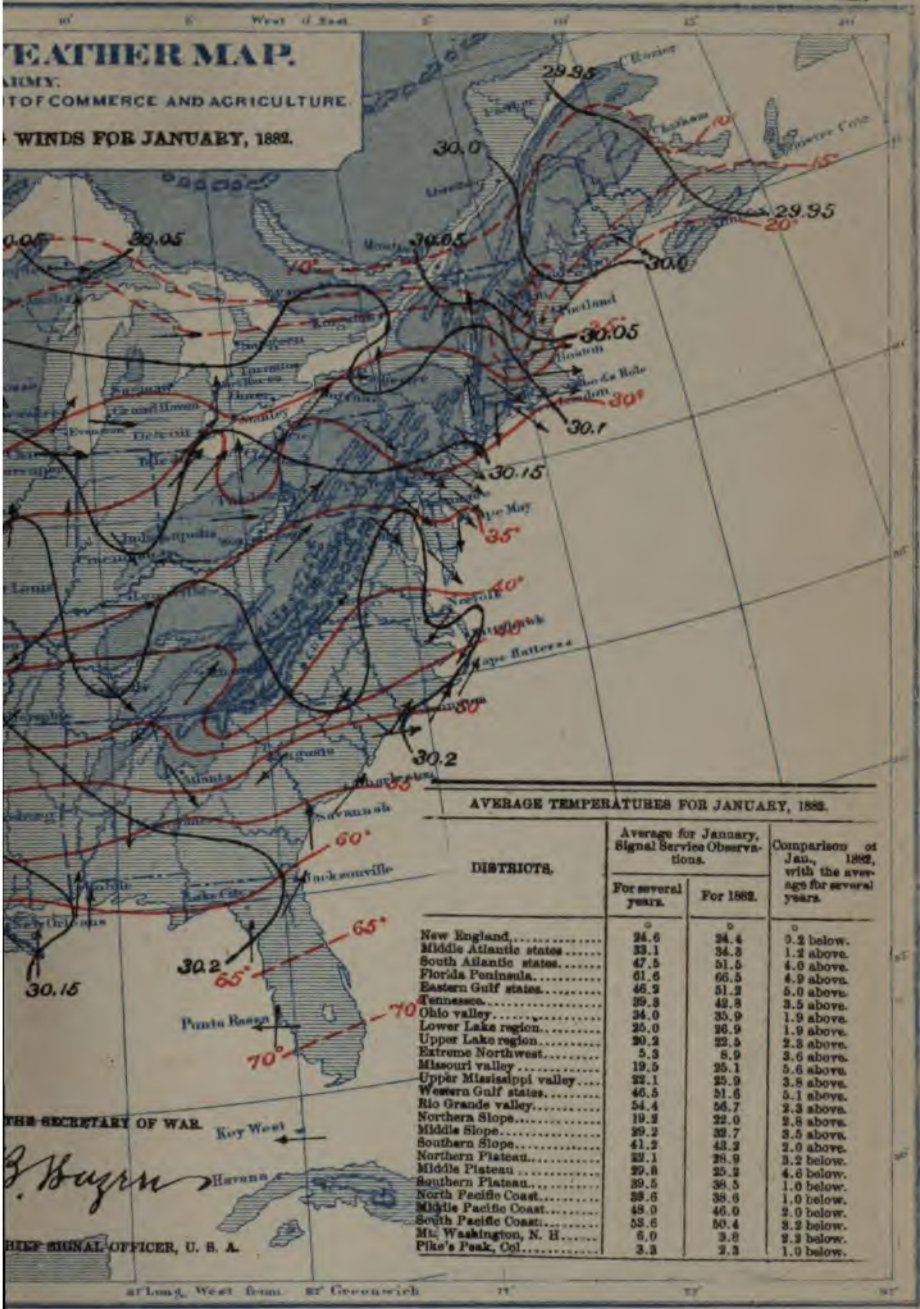


TEMPERATURE OF WATER FOR JANUARY, 1882.

STATIONS.	Temperatures at bottom.		Average depth of water, in feet.
	Max.	Min.	
Atlantic City	41.6°	35°	[illegible]
*Alpena	—	—	—
Augusta	55.8	42.3	10.[illegible]
Baltimore	42	33.5	9.[illegible]
Boston	37	29.[illegible]	25.[illegible]
Buffalo	35.6	32	16.[illegible]
Burlington, Vt.	38.5	3[illegible]	15.[illegible]
Cedar Keys	71	62	[illegible]
Charleston	57.5	48.4	40
Chicago	33.9	32.8	6.8
Chincoteague	45	30	5.6
Cleveland	39	32	14
*Detroit	—	—	—
Del. Breakwater	44	36	8.7
Duluth	34	32	15.6
Eastport	39	34.5	17
*Escanaba	—	—	—
Galveston	70	38	14.5
*Grand Haven	—	—	—
Indianola	68.6	49.5	6.6
Jacksonville	68	55	18
Key West	76.9	63.7	17.1
Marquette	33.8	32.3	10.6
Milwaukee	33.6	32.1	8
Mobile	56.1	50.5	17.2
New Haven	38.5	29.8	13.8
New London	42	33	12.10
Newport	41	30.2	10.1
New York	39.5	31.5	21.9
New Shoreham	44.2	34.8	9.4
Norfolk	45	37	16.4
Pensacola	65.4	54	17.6
*Portland, Maine	—	—	—
Portland, Or.	45	36	69.6
Port Eads	48.1	44.5	9.7
Punta Rassa	75.6	59.1	11.7
Sandusky	33.2	32.7	10
Sandy Hook	42	34.4	1.10
San Francisco	51.6	47.5	29.4
Savannah	60.5	46.5	12.4
Smithville	54.5	44.5	10
Thatcher's Island	37.8	33.5	7
*Toledo	—	—	—
Wilmington	52	44	13
*Wood's Holl	—	—	—

*Observations wanting—See text.

No. II.



AVERAGE TEMPERATURES FOR JANUARY, 1882.

DISTRICTS.	Average for January, Signal Service Observations.		Comparison of Jan., 1882, with the average for several years.
	For several years.	For 1882.	
	°	°	°
New England	24.6	24.4	0.2 below.
Middle Atlantic states	33.1	34.3	1.2 above.
South Atlantic states	47.5	51.5	4.0 above.
Florida Peninsula	61.6	66.5	4.9 above.
Eastern Gulf states	46.2	51.2	5.0 above.
Tennessee	39.3	42.8	3.5 above.
Ohio valley	34.0	35.9	1.9 above.
Lower Lake region	25.0	26.9	1.9 above.
Upper Lake region	20.2	22.5	2.3 above.
Extreme Northwest	5.3	8.9	3.6 above.
Missouri valley	19.5	25.1	5.6 above.
Upper Mississippi valley	22.1	25.9	3.8 above.
Western Gulf states	46.5	51.6	5.1 above.
Rio Grande valley	54.4	56.7	2.3 above.
Northern Slope	19.2	22.0	2.8 above.
Middle Slope	29.2	32.7	3.5 above.
Southern Slope	41.2	43.2	2.0 above.
Northern Plateau	32.1	28.9	3.2 below.
Middle Plateau	29.8	25.2	4.6 below.
Southern Plateau	39.5	38.5	1.0 below.
North Pacific Coast	39.6	38.6	1.0 below.
Middle Pacific Coast	48.0	46.0	2.0 below.
South Pacific Coast	53.6	50.4	3.2 below.
Mt. Washington, N. H.	6.0	3.8	2.2 below.
Pike's Peak, Col	3.3	2.3	1.0 below.

33

3

35

APPENDIX No. 83.

MONTHLY WEATHER REVIEW, FEBRUARY, 1882.

INTRODUCTION.

In preparing this Review the following data, received up to March 20th, have been used, viz, the regular tri-daily weather charts, containing the data of simultaneous observations taken at 135 Signal Service stations and 13 Canadian stations, as telegraphed to this office; 192 monthly journals and 165 monthly means from the former, and 13 monthly means from the latter; 234 monthly registers from voluntary observers; 57 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald Weather Service; abstracts of ships' logs, furnished by the publishers of the New York Maritime Register; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

To illustrate the subject of the distribution of mean atmospheric pressure over the United States and Canada for the month of February, 1882, Chart No. II has been prepared, upon which are traced the lines of equal barometric mean values. The areas of lowest mean pressure 30.00, occupy the northern portion of the Upper Lake region and the eastern half of the Canadian maritime provinces. The isobar of 30.05 runs southeastward from northern Dakota to southern Iowa and thence northeastward to the Province of Ontario; with a break in the line at Rockliffe, the isobar commences again near the mouth of the Saint. Lawrence and runs southward off the coast of Maine. Areas of 30.05 are also found in the lower portion of the Rio Grande Valley and in the North Pacific Coast region. Throughout the remainder of the country the pressure ranges from 30.07 to 30.24. Compared with the previous month the position of the areas of lowest mean pressure remain unchanged, but the barometer has fallen about 0.05 inch in the Lake Superior region and risen about the same degree in the maritime provinces, accompanying a deficiency in the former and an excess in the latter region.

Departures from the normal values for the month.—Compared with the means of previous years, the mean pressure for February, 1882, presents rather unusual features in the disposition and extent of areas of excess and deficiency. The central portion of the country, between the Ohio and Mississippi Rivers on the east and the Rocky Mountains on the west, is occupied by a decided area of deficiency, the departures ranging from 0.01 to 0.14 inch, increasing with the latitude. From the western border of this area to the Atlantic coast, departures of excess prevail, ranging from 0.01 to 0.13 inch. Only four stations, Eastport, Erie, Columbus, and Nashville, report the former departure, the range in general being from 0.04 to 0.09 inch; exceptional departures occur as follows: Mount Washington, 0.13 inch; Morgantown, 0.12 inch. From the eastern border of the area of deficiency to the Pacific coast, the departures of excess range in the extremes from 0.01 to 0.09 inch, but generally from 0.04 to 0.08 inch. The following stations report a normal condition: Indianola, Galveston, and Port Huron.

Barometric ranges.—The range of pressure for the present month has generally varied from 0.8 to 1.3 inches, and in the extremes from 0.42 inch at Key West to 1.58 inches at Saint Vincent, Minn., and Provincetown, Mass. The ranges increase with the latitude throughout the entire country and along the southern boundary of the United States from California and Florida inward to the maximum in Texas. Throughout the various districts the monthly barometric ranges varied as follows: New England, 1.12 inches on summit of Mount Washington to 1.49 inches at Thatcher's Island and Eastport, and 1.58 inches at Provincetown; Middle Atlantic States, 1.15 inches at Lynchburgh to 1.28 inches at Williamsport and 1.47 inches at Atlantic City; South Atlantic States, 0.84 inch at Jacksonville to 1.08 inches at Atlanta and Augusta and 1.42 inches at Hatteras and Kittyhawk; Florida Peninsula, 0.42 inch at Key West to 0.52 inch at Punta Rassa and 0.73 inch at Cedar Keys; Eastern Gulf States, 0.8 inch at Pensacola to 0.92 inch at Vicksburgh and 0.93 inch at Montgomery; Western Gulf States, 0.6 inch at Mason to 0.78 inch at Shreveport, 0.97 inch at Little Rock and 0.98 inch at Fort Gibson; Rio

Grande Valley, 0.62 inch at Uvalde to 0.72 inch at Rio Grande and 0.74 inch at Castroville; Ohio Valley and Tennessee, 0.95 inch at Nashville to 1.09 inches at Louisville, 1.17 inches at Pittsburgh, and 1.26 inches at Champaign; Lower Lake region, 1.23 inches at Toledo to 133 inches at Buffalo and Detroit and 1.43 inches at Port Huron; Upper Lake region, 1.18 inches at Chicago to 1.36 inches at Duluth, 1.37 inches at Marquette and Grand Haven, and 1.56 inches at Alpena; Upper Mississippi Valley, 0.89 inch at Des Moines to 1.16 inches at Saint Louis and 1.27 inches at Madison; Missouri Valley, 0.9 inch at Leavenworth to 0.92 inch at Omaha and Springfield and 1.12 inches at Huron; Extreme Northwest, 1.24 inches at Moorhead to 1.32 inches at Fort Stevenson and 1.58 inches at Saint Vincent; Northern Slope, 0.54 inch at Cheyenne to 0.77 inch at Helena, 1.03 inches at Fort Keogh and 1.16 inches at Fort Assinniboine; Middle Slope, 0.55 inch at Denver to 0.7 inch at Fort Elliott and 0.81 inch at Dodge City; Southern Slope, 0.46 inch at El Paso to 0.66 inch at Coleman and 0.89 inch at Henrietta; Northern Plateau, 0.87 inch at Fort Missoula to 1.01 inches at Lewiston and Dayton and 1.10 inches at Umatilla; Middle Plateau, 0.83 inch at Pioche to 0.89 inch at Winnemucca and 0.9 inch at Salt Lake City; Southern Plateau, 0.42 inch at Fort Grant to 0.48 inch at Santa Fé and Camp Thomas and 0.57 inch at Prescott; North Pacific coast, 1.03 inches at Portland to 1.35 inches at Olympia; Middle Pacific coast, 0.72 inch at San Francisco to 0.76 inch at Sacramento and 0.83 inch at Red Bluff; South Pacific coast, 0.43 inch at Campo to 0.57 inch at Yuma and 0.61 inch at Visalia.

Areas of high barometer.—Eight such areas were of sufficient importance to merit description.

No. I.—Was central in Missouri at midnight of the 2d; it then moved over the Lower Lake region and thence down the Saint Lawrence Valley. The temperature fell from 10° to 14° in the northern portion of the Upper Lake region on the 2d, and following the rise in barometer a fall in temperature of from 20° to 30° was experienced in the Lower Lake region, Saint Lawrence Valley, and New England.

No. II.—Highest in Wyoming on the 3d; in New Mexico on the morning of the 4th, and in Texas on the afternoon and night of Sunday; remained highest in the Gulf States during the 5th. The area of highest pressure moved into the South Atlantic States on the 6th; remained high there during the 7th, and extended into the Middle Atlantic States on the 8th, and into New England on the 9th. Midnight map of the 4th showed higher temperature in all districts west of the Mississippi; midnight of the 5th, temperature generally higher in all districts. In the Mississippi Valley and districts to east of it still higher at midnight of 6th, and continued to rise in New England, the Middle, South Atlantic, and Gulf States on the 7th. The extreme southern course of this area of high barometer produced a preponderance of southerly winds and a general increase of temperature during its progress.

No. III.—Entered the United States in Washington Territory on the 6th, and on the 7th reached the Missouri Valley, highest pressure, 30.40 inches at Yankton. This area of increased pressure then passed northeastward to Nova Scotia, accompanied by a fall in temperature of from 10 to 30 degrees. The cold wave reached the Missouri Valley on the 6th; on the 7th extended over the Upper Lake region and the Mississippi Valley, and passed over the Lower Lake region and the Middle Atlantic States on the 8th.

No. IV.—An area of increased pressure entered Texas on the 8th. Barometer highest in this State on the 9th; at Pittsburgh midnight of the 10th; on the Middle Atlantic coast on the 11th, and remained highest in the Middle and South Atlantic States during the 13th. The temperature fell from 10° to 16° in Texas on the 8th; generally in the Middle and South Atlantic States on the 9th, and in New England, the Middle, and South Atlantic States on the 10th.

No. V.—The barometer rose 0.15 inch on the California coast during the night of the 10th. This area of increased pressure passed northeastward, reaching Nova Scotia on the 14th. The pressure was highest in Colorado on the 13th; at Cairo on the morning of the 14th; extended to the South Atlantic States during the day, and there remained highest during the 15th. The following are the changes in temperature during the passage of this area: 11th, decided fall in California, Nevada, and Utah. Cold wave reached the Mississippi Valley on the 12th; extended over Lower Lake region, Ohio Valley, and Tennessee on the 13th, and to New England and the Middle Atlantic States on the 14th.

No. VI.—Increase of pressure first felt in Montana on the 15th; passed to the east and reached the Atlantic coast on the 18th. At midnight of the 15th the temperature had fallen in the Extreme Northwest and Montana from 10° to 40° in last twenty-four hours. This cold wave covered the Upper Mississippi and Missouri Valleys and the Lake region on the 16th, and had reached New England and the Middle and South Atlantic States on the 17th, where the fall continued during the 18th.

No. VII.—Passed from the Pacific coast and was central near Yankton on the morning of the 19th; barometer at this station 30.56. Morning of the 20th highest in Manitoba. The area of increased pressure passed thence eastward to the Atlantic coast. At midnight of the 18th the temperature had fallen from 10° to 20° in the Missouri Valley, and during the next day the cold wave extended over the Mississippi Valley, Kansas, and Indian Territory. Afternoon of the 19th the temperature at Fort Gibson, 10°, a fall of 55° in twenty-four hours. 20th, fall of from 10° to 35° in Texas, and 6° to 17° in the Lake region.

No. VIII.—This area moved from the coast of California to Texas, where it was central on the morning of the 21st. Morning of 22d highest in Arkansas and Missouri. 23d, extended from Saint Paul to Leavenworth. 24th, an area of 30.50 inches covered the Lake region, Tennessee, and the Ohio Valley. 25th, highest at Pittsburgh. 26th, highest over Virginia, North and South Carolina; pressure decreased during the day. Morning of the 27th, highest barometer 30.30 at Baltimore. Morning of the 28th, an area of 30.40 extended over New England and the Canadian maritime provinces. The following changes in temperature were noted during the passage of this area: Morning of the 21st, fall of 13° to 30° in Texas; 10° to 20° in the East Gulf States and Tennessee and in the Mississippi and Missouri Valleys. Morning of the 22d cold wave covered all stations east of the Mississippi; Pittsburgh, 25°, a fall of 32°; Charlotte, N. C., 37°, a fall of 25°. In the South Atlantic States the temperature continued to fall during the 23d and 24th.

Areas of low barometer.—Eleven areas of barometric minima appeared within the limits of the Signal Service weather maps during the month of February, 1882, all of which merit description.

No. I.—Passed from Lake Superior to the Saint Lawrence Valley on the 1st, causing high SW. winds in the Lower Lake region.

No. II.—Followed immediately after No. I; was central north of Lake Superior on the morning of the 2d and passed to the eastward accompanied by very little precipitation. Southwest winds prevailed during the day in New England, the Middle Atlantic States, and Lower Lake region and had generally veered to NW. by morning of the 3d. Velocities of 28 to 34 miles were recorded in the Lower Lake region and from 26 to 35 on the New England coast. The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicates the presence of this storm during its passage eastward over the ocean: Steamship Vaderland, 5th, in 47° 47′ N., 38° 02′ W., 29.33, a fall of 0.67 inch, W. to NE., heavy gale with high sea and rain; 6th, in 47° 10′ N., 42° 05′ W., 29.08, W. to WSW., strong gales, heavy sea, thunder and lightning; 7th, in 46° 21′ N., 44° 38′ W., 29.27, WSW. to WNW., heavy gale with tremendous sea. Steamship Arizona, 4th, in 43° 58′ N., 54° 20′ W., variable to NW., strong breeze, overcast and high head sea; 5th, in 42° 10′ N., 62° 24′ W., NW. to SW., strong gale increasing to hurricane, dangerous sea; 6th, in 41° 22′ N., 63° 25′ W., W., strong gale with high head sea. Steamship City of Brussels, 4th, in 42° 44′ N., 53° 54′ W., SSW. to NW., strong breeze to fresh gale; 5th, in 41° 59′ N., 60° 22′ W., fresh to strong gale, heavy snow; 6th, in 41° 33′ N., 61° 40′ W., SSE. to SW. and W., hurricane for twelve hours, followed by heavy gale from W.; 7th, in 41° 02′ N., 66° 18′ W., NW., strong breeze, very heavy squalls, high sea, followed on the 8th by fine weather. Steamship W. A. Scholten, 4th, in 43° 32′ N., 53° 14′ W., 29.38, a fall of 0.74 inch in past twenty-four hours, NW., force 8, high sea; 5th, in 42° 37′ N., 57° 24′ W., 29.71, ESE., force 4, very high sea; 6th, in 41° 57′ N., 58° 47′ W., 29.42, NW., force 10, very high sea, stormy; 7th, in 41° 09′ N., 61° W., 30.20, NW., force 8, very high sea, stormy. Steamship P. Caland, 9th, in 49° 44′ N., 22° 38′ W., 29.00, a fall of 0.94 inch, WSW., force 6. Ocean data from other sources as follows: Steamship Athos, 3d, 11 p. m., in 37° N., 74° W., violent storm from NE., barometer 30.40; wind gradually increased and hauled to E. with rapidly falling barometer, accompanied by torrents of rain. 4th, barometer 29.65, wind shifted to SE., blowing a heavy gale, with high sea and much rain; noon, wind suddenly shifted to WSW. with increased violence, hard squalls and rain; 2 p. m., wind backed to S. and at 8 p. m. shifted to W., still very violent, with heavy rain and terrific sea; 6 p. m., gale increased to hurricane and settled down from W. with clearing weather, barometer 29.18. 5th, 3 a. m., in 34° N., 74° W., gale continued as hard as ever with tremendous high sea, barometer rising gently and at midnight reached 30.30, with fine, clear weather. Steamship Belgenland, 4th, in 40° 23′ N., 73° 13′ W., violent gale accompanied with heavy snow and rapidly falling barometer, wind started at NE. shifting to N. and NW., blowing with great violence, barometer 28.70 at 3 p. m. At 10 p. m. perfectly calm, when suddenly without any warning gale sprang up from the SW. and blew violently for about two hours, when it again shifted to NW. and blew a heavy gale, sea very high, barometer steadily rising. Steamship Muriel, 4th, off Highlands, New Jersey coast, heavy E. wind with threatening weather and snow; gale steadily increased and during the night became a most violent storm, accompanied with heavy snow. Barometer fell steadily, and on morning of the 5th reached 29.05, when wind suddenly shifted to NW. and WNW., followed by clearing weather.

Nos. III and IV.—The morning map of the 3d showed No. III central in Manitoba and No. IV near Galveston. The northern storm produced but slight changes and lost its identity on the afternoon of the 4th; at this time No. IV was central near Norfolk, Va. Barometer at that station 29.31 inches, a fall of 0.81 inch in last twenty-four hours. The following are the weather conditions noted during the passage of this storm: In the West Gulf States heavy rains on the 2d and 3d, generally clear at midnight of 3d, with wind NW.; East Gulf States, heavy rains 3d and 4th, clear, with NW. winds at midnight of 4th; South Atlantic States, rain on 4th; Middle Atlantic States, NE. winds and heavy snow on 4th, clearing and winds westerly on 5th; New England, snow on 4th and 5th. The following velocities were recorded: Galveston, NW. 40; Indianola, NW. 51; Pensacola, SW. 36; Cedar Keys, W. 38; from 30 to 42 on the South Atlantic coast; 60 miles at Cape Hatteras and Cape May; 64 miles at New Shoreham and 28 to 40 miles on the New England coast. The following ship's report probably indicates the presence of this storm during its passage eastward over the ocean: Steamship Iberian, 6th, in 47° 30′ N., 43° 38′ W., 29.15, wind unsteady from SW. to SE. Barometer continued falling and on the 8th, in 50° 38′ N., 30° 20′ W., wind hauled to E., with heavy rain; 8 p. m., wind backed to SW. with increasing force, and on the following morning blew a hurricane for about three hours, when it moderated with fine, clear weather by noon.

No. V.—Was central on the morning of the 6th near Fargo. Weather generally fair in all districts. On the 7th it rained in the Lower Lake region, Tennessee, and the Ohio Valley, and snowed in the northern portion of New England. In the Middle Atlantic States, rain fell during night of the 7th. Velocities of 28 to 32 miles were recorded in the Lake region and from 25 to 31 miles on the New England coast. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean; Steamship Vaderland, 8th, in 45° 39′ N., 47° 19′ W., 29.74, WNW., heavy gale with very high sea, vessel slowed, shipping heavy water; 9th, in 45° N., 51° 05′ W., 29.51, SSE. to NW., moderate gale, changing suddenly to complete cyclone with terrible sea, vessel severely damaged; 10th, in 44° 07′ N., 54° 53′ W., 29.47, NW. to SE., heavy gale, terrible sea; 11th, in 42° 51′ N., 57° 32′ W., 29.32, SE. to NNE., terrific gale, ending in a complete revolving storm, violent sea; 12th, in 42° 30′ N., 59° 24′ W., 30.50, NNE. to N., terrible gale with tremendous sea; 13th, in 41° 34′ N., 64° 10′ W., 30.32, N. to WSW., wind and weather moderate, sea smooth. Steamship City of New York, 9th, in 44° 22′ N., 44° 45′ W., N. to S., strong breeze to strong gale, high head sea; 10th, in 43° 41′ N., 47° 29′ W., S. to NW., strong gale to light breeze, very high head sea. Steamship Celtic, 8th, in 43° 24′ N., 53° 18′ W., WNW., strong gale, heavy head sea; 9th, in 42° 16′ N., 58° 22′ W., NNW., strong gale, high head sea; 10th, in 41° 10′ N., 65° 13′ W., SW., strong breeze with rain. Steamship Catalonia, 8th, in 45° 42′ N., 53° 29′ W., WNW. and NW., strong gale; 9th, in 45° 27′ N., 57° 45′ W., NW., heavy gale, high sea. Steamship P. Caland, 12th, in 48° 49′ N., 34° 37′ W., 29.24, a fall of 0.56 inch, WSW., force 9, heavy squalls with rain.

No. VI.—This area appeared central near Brownsville, Tex., at midnight of the 7th. It rained during the night in the Gulf States. General and heavy rains occurred in the South Atlantic States, Tennessee, and the Ohio Valley on the 8th, and in the Middle Atlantic and New England States on the 9th. Velocities noted: 26 to 32 miles at Gulf stations; 34 to 48 miles on South Atlantic coast and 28 to 46 miles on the Middle Atlantic and New England coasts. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Abyssinia, 10th, in 47° 29′ N., 40° 06′ W., WNW., heavy gale, snow and hail showers, high sea; 11th, in 45° 59′ N., 45° 40′ W., westerly, fresh to moderate gale, squalls and showers of rain and hail; 12th, in 44° 46′ N., 48° 50′ W., W. to NNW., strong gale, very high confused sea, cold, frosty weather. Steamship Gallia, 11th, in 43° 46′ N., 48° 53′ W., S. to W., fresh gale to moderate breeze and head sea; 12th, in 42° 54′ N., 52° 45′ W., W. to NW., strong gale and high confused sea; 13th, in 41° 55′ N., 59° 20′ W., N. to NW., fresh breeze and head sea. Steamship City of New York, 11th, in 42° 38′ N., 52° 25′ W., S. to W., light breeze to strong gale, very high head sea; 12th, in 42° 16′ N., 56 W., W. by S. to NW., strong gale and high confused sea. Steamship Catalonia, 10th, in 44° 33′ N., 62° 45′ W., wind shifted from NW. to WSW. and E., strong gale, heavy snow, stopped engines, ship drifting. Steamship Republic, 10th, in 40° 37′ N., 68° 16′ W., 29.26, W. by S., force 2, drizzling rain; 11th, in 41° 13′ N., 61° 01′ W., 29.82, NW., force 7, overcast, snow and hail; 12th, in 41° 42′ N., 53° 14′ W., 30.31, NNW., force 6, cloudy, snow and hail.

No. VII.—Was central near Bismarck on the afternoon of the 10th, having moved from Washington Territory in past twenty-four hours. Rain fell in the Upper Mississippi Valley on the 11th, and in Texas during the night of the same day. General rains occurred in the Lower Lake region, Tennessee, and the Ohio Valley and the East Gulf States on the 12th and 13th. In the New England and Middle Atlantic States on the

13th and in the South Atlantic and East Gulf States on the 14th. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Abyssinia, 14th, in 42° 42′ N., 60° 13′ W., WSW., fresh gale, heavy rain and high head sea; 15th, in 41° 06′ N., 65° 53′ W., westerly, moderate to light winds, fine weather and moderate sea. Steamship Zeeland, 14th, in 47° 33′ N., 39° 13′ W., 30.02, a rise of 0.28 inch in past twenty-four hours, WNW. to NW., strong breeze with heavy squalls, high head sea, clear; 15th, in 46° 51′ N., 43° 17′ W., 29.90, W. to WSW. and NW., strong, fresh breeze, sea moderating, by noon light rain; 16th, in 46° N., 49° 11′ W., 29.88, N. and NE., moderate to fresh breeze, light snow squalls at intervals. Ocean data from other sources as follows: Steamship Mississippi, 9th, in 48° 17′ N., 123° 55′ W., near entrance to Straits of Juan de Fuca, took heavy gale commencing at NE. with heavy snow. Wind backed gradually around to WNW., when it moderated and cleared. Shortly after barometer fell rapidly to 28.90, remaining steady until about noon, when it commenced rising and at 3 p. m. stood at 29.65, where it remained steady for twenty-four hours. Sea from SSE., high and confused; wind throughout the storm between WNW. and NE. Course, a little north of west out of the straits; when south of entrance about 20 miles gale moderated. Barometer continued falling until course was changed to S., when it remained stationary for about three hours, rising thereafter as suddenly as it fell.

No. VIII.—Central in southern Wisconsin at midnight of the 15th; moved northeast to the Saint Lawrence Valley, and thence southeast, passing off the coast of Maine. During the night of the 16th rain fell in the Middle Atlantic States and the Lower Lake region, and snow in New England on the 16th and during the night of the same day. High winds occurred on the North Atlantic coast after the passage of the center. The following reports furnished through the co operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Waesland, 18th, in 46° 46′ N., 38° 52′ W., 29.62, a fall of 0.36 inch in past twenty-four hours, NE. to SE., partly cloudy, with rain during latter part of day; 19th, in 45° 05′ N., 45° 42′ W., 29.42, SSW., overcast and smooth sea; 20th, in 43° 29′ N., 50° 40′ W., 29.91, NNW., strong, overcast with snow squalls. Steamship City of Montreal, 17th, in 42° 26′ N., 60° 18′ W., W. to SSW., light breeze, clear; 18th, in 41° 06′ N., 65° 35′ W., SW. to NW. and N., fresh wind to fresh gale, heavy rain, changing to snow, heavy beam sea. Steamship Britannic, 16th, in 44° 31′ N., 47° 50′ W., W. and N., fresh breeze and overcast; 17th, in 42° 53′ N., 56° 26′ W., variable, light breeze and fine; 18th, in 41° 43′ N., 63° 34′ W., 29.89, a fall of 0.91 inch in past twenty-four hours, S. and N., hard gale and high sea. Steamship Servia, 18th, in 42° 50′ N., 55° 36′ W., southerly, moderate breeze; 19th, in 41° 23′ N., 62° 08′ W., northerly, strong gale and heavy squalls. Steamship Zeeland, 17th, in 44° 38′ N., 54° 01′ W., 29.80, NW. to W. and SW., light breeze and dense fog throughout the whole twenty-four hours; 18th, in 43° 36′ N., 57° 30′ W., 29.74, SW. to W. and NNW., fierce gale, tremendous sea, occasional snow squalls; 19th, in 42° 26′ N., 59° 28′ W., 29.88, northerly gale, weather and sea moderating. Steamship Celtic, 17th, in 40° 41′ N., 69° 46′ W., 29.57, SW., force 4, foggy; 18th, in 41° 04′ N., 62° 40′ W., 29.95, NW., force 6, cloudy; 19th, in 41° 51′ N., 55° 29′ W., 29.75, NW., force 6, cloudy.

No. IX.—Was central in Colorado on the morning of the 18th. Rain fell during the day in the Upper Mississippi Valley and Upper Lake region. The rain area moved eastward into New England and the Lower Lake region during the 19th, and on the same day heavy and general rains occurred in the Ohio Valley and Tennessee. The following reports furnished by the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Waesland, 21st, in 42° 19′ N., 57° 19′ W., 29.93, strong easterly winds, overcast with snow squalls. Steamship Zeeland, 20th, in 41° 20′ N., 64° 07′ W., 29.64, a fall of 0.24 inch in past twenty-four hours, N. to SW., calm, cloudy; 21st, in 40° 47′ N., 69° 11′ W., 29.70, N. to ENE. and ESE., light to fresh breeze, with occasional rain. Steamship Wisconsin, 19th, in 43° 39′ N., 53° 54′ W., N. to W., heavy gale and snow; 20th, in 42° 23′ N., 59° 54′ W., N. to E., moderate gale, snow and heavy head sea; 21st, in 40° 48′ N., 66° 18′ W., N. to SE., gales and snow. Steamship Assyrian Monarch, 19th, in 41° 50′ N., 63° 45′ W., N., heavy gale and high sea.

No. X.—Central in Texas at midnight of the 19th, with heavy rains in West Gulf States. The rain of the 19th, in Tennessee and the Ohio Valley, continued during the 20th. This day rain fell in Lower Lake region and Middle Atlantic States, and snow in the Upper Lake region. On the 21st it rained in Tennessee and the Middle Atlantic States, and snow fell in the Ohio Valley, the Lower Lake region, and in New England. Snow continued in the Lake region and New England on the 22d and 23d, the weather generally clearing in the other districts. The following reports furnished through the co-operation of the New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean: Steamship Waesland, 22d, in

41° 35′ N., 63° 46′ W., 29.14, a fall of 0.79 inch in past twenty-four hours, ESE., partl cloudy, changing to stormy weather; 23d, in 40° 44′ N., 64° 54′ W., 29.48, W., heavy gale with high head sea, ship laboring heavily; 24th, in 40° 17′ N., 71° 01′ W., 29.96 N., moderating, snow squalls. Steamship Helvetia, 22d, in 45° 38′ N., 44° 48′ W., NE. strong breeze and beam sea; 23d, in 42° 58′ N., 50° 20′ W., variable light winds and cloudy; 24th, in 42° N., 55° 10′ W., variable, moderate gale and snow squalls; 25th, in 41° 03′ N., 60° 57′ W., N. to NNE., moderate gale and snow squalls. Steamship The Queen, 22d, in 40° 28′ N., 69° 42′ W., SE. to WNW., heavy head sea and rain. Steamship Parthia, 24th, in 46° 13′ N., 42° 58′ W., SSW. to WSW. and SE., moderate breeze, cloudy with rain and confused sea. Steamship Zeeland, 22d, in 40° 29′ N., 73° W., 29.58, a fall of 0.12 inch in past twenty-four hours, SE. to W. and WNW., strong breeze, rainy and misty. Steamship Baltic, 21st, in 43° 03′ N., 51° 15′ W., W. and NE., variable, cloudy, confused sea; 22d, in 42° 16′ N., 58° 55′ W., variable, strong winds, squally, rough sea; 23d, in 41° 39′ N., 62° 57′ W., NW. and N., strong gale, heavy head sea.

No. XI.—Moved down the Missouri Valley on the 27th; on the morning of the 28th it was central near Little Rock, and thence moved NE. to the Lake region. Heavy and general rains occurred during the passage of this storm in the Mississippi Valley, Tennessee, and the Ohio Valley, the East Gulf States, the Lake region, the Middle Atlantic and New England States.

INTERNATIONAL METEOROLOGY.

International Charts Nos. IV and V accompany the present Review for February, 1882. The former is published for December, 1879, and continues the series of that chart, commenced in January, 1877. The "Beobachtungen auf dem Nordatlantischen Ocean," for December, 1879, kindly furnished this office through the courtesy of Prof. Dr. G. Newmayer, director of the German Marine Observatory, has been used in the preparation of the present chart. Chart No. V is prepared for the month of March, 1880, and continues the series of this chart, commenced in November, 1877.

Chart No. IV shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m. Washington, or 0.43 p. m. Greenwich mean time, for the month of December, 1879, over the Northern, and at certain isolated stations in the Southern Hemisphere. The pressure is generally high, even over British India, where the mean at no station falls below 29.92. There are two areas of comparative barometric minima, one embracing Iceland and Greenland and the other occupying northeastern Russia and northwestern Siberia. The most decided of the above indicated depressions is the former, lowest mean reading 29.47, at Stykkisholm. This area of barometric minima probably resulted from the translation northward of one of the November depressions (29.90) central over the Azores and Madeira Islands, and its combination with a slight depression (29.80) central that month over Greenland. There are five principal areas of high pressure for the month, distributed as follows: In central Mexico, 30.30; in Manitoba, 30.20; in 35° N., 70° W., 30.20; in western Europe, 30.40; in southeastern Siberia, 30.40. The extreme mean pressures for the month are, 29.47 (lowest) at Stykkisholm and 30.49 (highest) at Nertschinsk. The extreme monthly range of mean pressure for the month is 1.02 inches, which is 0.52 inch smaller than the range for December, 1877, and 0.18 inch smaller than the range for the same month in 1878. The following extreme monthly mean temperatures are given in Fahrenheit's scale: *Lowest:* York Factory, —31°; Fort Garry, —18°; Moose Factory, —16°; Nertschinsk, —12°; Fort Buford, —8°; Bismarck, —5°; Nikolaievsk, —3°; Yeniseisk, 1°; Ekaterinburg, 3°; Kasan, 8°; Archangel, 10°; Godthaab, 14°; Szathmar, 16°; Bamberg and Haparanda, 17°; Zurich, 19°. *Highest:* Mauritius, 80°; Paramaribo, 79°; Santiago, Cape Verde Islands, and Fort Napier, 78°; Poona and Bridgetown, 77°; Fort de France, Navassa, and Bombay, 76°; Kingston, Jamaica, Santiago de Cuba, and San Juan de Puerto Rico, 74°; Honolulu, 71°; Tlacotalpam, 70°. The prevailing direction of the winds over the United States was southwesterly in the Atlantic Coast States, except westerly in New England; southerly from the Gulf coast, northeastward to the Lakes; northwesterly in the Lake region, Upper Mississippi, and Lower Missouri Valleys, Rocky Mountain Slopes and in western Texas; southerly in the Northern Pacific Coast region and variable in the Middle and Southern Pacific Coast and Plateau regions. In Canada and the maritime provinces, westerly. In Central Mexico, variable. Over the Atlantic Ocean from the American coast eastward to 40° W., northeast, and northwest; from the European coast westward to 40° W., northeast, southeast, and southwest. In Europe, southwesterly north of 50° N. and west of 30° E.; south of that parallel and in Russia, northeast to northwest. In Algiers, northerly. In Hindostan, variable. Along the Asiatic coast and over the Japan Islands, northeast to northwest. Compared with December, 1877 and 1878, the temperature over the United States is considerably lower in the Pacific Coast States, the Rocky Mountain regions, in the Upper Mississippi and Lower Missouri Valleys, in the Upper Lake region, Saint Lawrence Valley, and in the Canadian maritime provinces, the change ranging from 3° to 20°, being most marked in the vicinity of the Upper Lake region. The pressure is considerably higher on the Pacific coast south of Oregon, also in the northern sections of the country and in Canada, while in the southeastern portion of the United States the barometer shows but little change. Over the Atlantic the pressure is considerably higher south of 50° N. and west of 40° W. In the region of the Azores and Madeira Islands there is a fall of about 0.10 inch. The greatest change occurs north of 50° N., where there is a decrease of 0.05 to 0.20 inch. The change in temperature is very small except north of 50° N., where, west of 35° W., there is a decided fall, and to the eastward a considerable rise. In the various countries of Europe and Asia, the following changes occur: British Isles, temperature slightly lower and the pressure from 0.11 to 0.50 inch higher. Denmark, temperature from 3° to 5° lower, and pressure from 0.40 to 0.50 inch higher. Norway, temperature normal and the pressure from 0.01 to 0.20 inch higher. Sweden, temperature from 1° to 3° lower and the pressure from 0.07 to 0.27 inch higher. France, temperature from 3° to 10° lower and the pressure from 0.20 to 0.40 inch higher. Germany, temperature from 4° to 16° lower and the pressure from 0.25 to 0.55 inch higher. Austria, temperature from 10° to 17° lower and the pressure from 0.30 to 0.45 inch higher. Algeria, temperature from 0°.5 to 2° lower and the pressure from 0.15 to 0.25 inch higher. Italy, temperature from 2° to 5° lower and the pressure from 0.20 to 0.35 inch higher. Portugal, temperature from 6° to 9° lower and the pressure from 0.09 to 0.12 inch higher. Spain, temperature slightly lower and the pressure from 0.10 to 0.20 inch higher. Turkey, temperature from 1° to 3° higher and pressure from 0.08 to 0.24 inch higher. Russian Empire, temperature from 1° to 3° higher and pressure from 0.05 to 0.50 inch lower. British India, temperature from 1° to 3° lower and the pressure from 0.01 to 0.05 inch lower. The accompanying table shows the deviations in temperature and barometer at isolated stations for the month of December, 1879, as compared with the means of the past two years:

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.		
	December, 1877-'78.	December, 1879.	Departure.	December, 1877-'78.	December, 1879.	Departure.
	°	°	°			
York Factory	— 4.0	—31.4	—27.4	29.90	30.06	+0.16
Godthaab	23.7	14.0	— 9.7	29.67	29.48	—0.19
Stykkisholm	25.8	33.3	+ 7.5	29.68	29.47	—0.21
Tromso	29.5	28.8	— 0.7	29.59	29.48	—0.11
Thorshavn	36.1	41.9	+ 5.8	29.67	29.80	+0.13
Archangel	20.4	10.0	—10.4	30.02	29.58	—0.44
Ekaterinburg	10.6	3.2	— 7.4	30.53	29.75	—0.53
Barnaul	— 9.0	10.8	+19.8	30.59	30.06	—0.53
Yenisiesk	—15.6	1.2	+16.8	30.62	30.06	—0.56
Nikolaievsk, on the Amoor	—10.6	— 3.1	+ 7.5			
Zi-Ka-Wei	40.1	39.0	— 1.1	30.37	30.24	—0.13
Tokei	40.5	44.1	+ 3.6	29.89	29.90	+0.01
Pekin	22.5	28.8	+ 6.3	30.38	30.26	—0.12
Tashkend	29.6	38.8	+ 9.2	30.58	30.21	—0.37
Nukuss	25.6	33.8	+ 8.2	30.44	30.10	—0.34
Beirut	67.3	62.4	— 4.9	30.03	30.02	—0.01
Mauritius	80.3	80.2	— 0.1	29.95	29.91	—0.04
Fort Napier	75.1	78.1	+ 3.0	29.79	29.75	—0.04
Paramaribo	81.8	79.0	— 2.8	29.98	29.98	Normal
Funchal	66.7	65.8	— 0.9	30.12	30.10	—0.02
Ponta Delgado	63.2	63.1	— 0.1	30.09	30.02	—0.07
Angra	60.0	59.7	— 0.3	30.09	29.94	—0.15
Bridgetown	80.4	77.1	— 3.3	29.94	29.95	+0.01
Navassa	78.7	76.1	— 2.6	29.98	30.02	+0.04
San José de Costa Rica	66.7	64.2	— 2.5			
Mexico	45.9	45.9	Normal	30.26	30.26	Normal
Melbourne	59.7	59.2	— 0.5	29.92	29.87	—0.05
Hobart Town	59.2	59.5	+ 0.3	29.69	29.70	+0.01
San Juan de Puerto Rico	77.2	74.1	— 3.1	29.99	30.06	+0.07
Nassau	71.2	73.0	+ 1.8	30.10	30.15	+0.05
Havana	70.9	72.2	+ 1.3	30.07	30.09	+0.02
Astrakhan	29.7	27.7	— 2.0	30.32	30.09	—0.23
Athens	56.9	50.0	— 6.9	29.95	30.14	+0.19
Lahore	57.3	58.1	+ 0.8	30.04	30.04	Normal
Tiflis	37.8	43.7	+ 5.9	30.23	30.15	—0.08
Laghouat	58.3	50.9	— 7.4	30.07	30.29	+0.22
Fort de France	77.8	76.1	— 1.7	29.87	29.98	+0.11
Lisbon	53.4	49.3	— 4.1	30.14	30.25	+0.11
Madrid	45.6	41.9	— 3.7			
Cagliari	53.4	51.3	— 2.1	29.88	30.12	+0.24
Sandwick Manse	37.5	40.5	+ 3.0	29.66	30.03	+0.37
Malta	62.8	57.6	— 5.2	29.95	30.11	+0.16

Chart No. V.—This chart displays the tracings of the probable courses of twenty-ieght of the principal storm areas of the Northern Hemisphere for the month of March, 1880. The approximate paths of progressive movement are based upon daily simultaneous international observations to the number of over 650, besides a large mass of irregular data which reaches this office in various ways, from the logs of vessels of the merchant marine of the North Atlantic and North Pacific Oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given: Fifteen areas traversed portions of the United States, six of which entered that country from the British Possessions and four from the Pacific Ocean. Twelve of these storms reached the Atlantic Ocean, five of which passed eastward beyond the 30th meridian west, and one entered southwestern Europe over Spain. Nine areas traversed portions of northern Europe and northwestern Asia, five of which came from the Atlantic Ocean. Four areas passed northeastward in the vicinity of the Japan Islands. Of the storms first appearing in North America, the following brief descriptions are given: No. I.—This depression appeared off the coast of British Columbia on the 1st, accompanied by rain and southerly winds in the North Pacific Coast region. During the day the area of barometric minima moved rapidly southeastward and by the following morning was central in northern Montana; Virginia City, 29.15, a fall of 0.23 inch, SW. fair. 3d, depression central in the northern portion of the Upper Mississippi Valley, with a barometric trough of 29.60 running southeastward from Lake Superior to western Texas; Omaha, 29.43, a fall of 0.52 inch, S. cloudy; Saint Paul, 29.44, a fall of 0.52 inch, SE. threatening. During the day the northeastern portion of the depression moved rapidly eastward, and on the following morning was central in the Lower Saint Lawrence Valley, accompanied by southerly winds and light to heavy rain and snow in the Canadian maritime provinces. Chatham, N. B., 29.59, a fall of 0.76 inch, S. cloudy; Windsor, N. S., 29.59, a fall of 0.77 inch, SE. raining; Bathurst, N. B., 29.61, a fall of 0.74 inch, S. snowing. 5th, depression central south of Newfoundland, followed by northerly winds and rising barometer in the maritime provinces; in 42° N., 60° W., SSW., and NNW., strong, violent rain squalls; in 43° 29′ N., 49° 20° W., WNW., fresh gale, high sea. 6th, in 42° 36′ N., 55° 04′ W., WNW., fresh gales, high sea; in 44° 45′ N., 45° 03′ W., S. and SW., heavy gale, with rain squalls; in 45° 08′ N., 48° 50′ W., strong WNW. gale hauling to NNW.; in 43° 18′ N., 48° 51′ W., 29.27, SW., force 7, cloudy. 7th, in 48° N., 47° W., strong NW. gales, encountered several icebergs, some apparently 120 feet high; in 43° N., 51° W., W. and NW., strong gale, high cross-sea; in 45° N., 43° W., WNW., heavy storm, hail and rain squalls; in 48° N., 34° W., WSW., strong gale, in 48° N., 31° W., NW to SE., fresh gale to calm; in 42° 51′ N., 52° 49′ W., 29.83; NW., force 7, high sea and cloudy. 8th, depression central near 50° N., 40° W In 47° N., 36° W., SSE. to NW., very stormy, with rain and high sea; in 46° 43′ N., 39° 30′ W., W. hard gale; in 49° 22′ N., 26° 01′ W., 29.57, SW., force 7, very high sea and cloudy. 9th, in 48° 29′ N., 31° 10′ W., 29.27, ENE., force 7, high sea and cloudy. 10th, in 49° 52′ N., 29° 39′ W., S. and NW., heavy gales, very high sea; in 48° 27′ N. 31° 25′ W., NW., strong gale, high, confused sea; in 46° 19′ N., 38° W., 29.70, NNW., force 4, moderate sea, hailing. Owing to lack of reports the further course of this depression could not be indicated upon the chart. In all probability it did not pass eastward to the mainland of northern Europe because of the high pressures prevailing in that region, ranging from 30.30 to 30.70, highest in Norway. Throughout the whole of western Europe the pressure was above 30.20. No. IV.—Rapidly following area No. I, this depression appeared off the coast of British Columbia on the 3d, accompanied by southerly winds and rain and snow in the North Pacific Coast region. Olympia, 29.40, a fall of 0.23 inch, S., light snow. 4th, depression central in Lower Missouri Valley. Dodge City, 29.14, a fall of 0.13 inch, S., cloudy; North Platte, 29.23, a fall of 0.06 inch, N., cloudy. 5th, central in the Lower Lake region. Buffalo, 29.22, a fall of 0.42 inch, SW., clear. Kingston, Ontario, 29.21, a fall of 0.54 inch, NE., cloudy; Norwood, Ontario, 29.20, a fall of 0.33 inch, NE., gloomy. The following day this depression combined with area No. I, then central over the ocean southeast of Nova Scotia. No. VI.—Probably central in British Columbia on the 4th; this depression passed rapidly southeastward over the Saskatchewan Valley and by the morning of the 6th was central in eastern Dakota, inclosed by the isobar of 29.80. 7th, depression central north of Lake Superior, with diminished energy, and during the day passed eastward to the Lower Saint Lawrence Valley, becoming central on the following morning over the Gulf. During the 8th the depression disappeared to the eastward over Newfoundland, possibly combining with No. I. No. VIII.—This depression first appeared in the Rio Grande Valley on the 6th, and with slight energy but rapid movement the area passed northeastward over the northern portion of the Western Gulf States, through Tennessee and southern Virginia, reaching the Atlantic Ocean during the afternoon of the 7th, disappearing thereafter in a high-pressure area, 30.30. No. IX.—Probably central in the Saskatchewan Valley on the 7th, the depression moved southward to the Middle Plateau, where it was central on the 8th. 9th, depression central in southern California, passing thence east-southeast through Arizona and New Mexico to the Rio Grande Valley, where it was central on the 11th. During this day and the following the depression pursued a very irregular course, disappearing on the 13th in a high-pressure area over the eastern portion of the Gulf of Mexico. No. X.—This depression appeared in the Rio Grande Valley on the 8th, and during the day passed northeastward over the western portion of the Gulf and thence across the central portion of the Eastern Gulf States, reaching the south Atlantic coast on the 9th. During the day the center passed eastward off the coast, and by the following morning was central over the ocean in about 40° N., 60° W.. In 39° 31′ N., 60° 34′ W., 29.13, W., force 6, 12 hours heavy rain, heavy SE. to W. sea. 11th, in 48° 32′ N., 38° 15′ W., 29.72, ESE., force 6, cloudy; in 45° N., 42° 55′ W., 29.04, SW.,force 9, very heavy sea, cloudy; in 48° N., 35° W., NW. and S., heavy gales; in 47° 17′ N., 37° 20′ W., variable winds, heavy gales, with dangerous sea; in 45° N., 42° 55′ W., 29.30, SW., force 11, heavy gale, with rain squalls; in 44° N., 25° W., very heavy SE. gales; in 43° 51′ N., 47° 29′ W., SSE. to NW., heavy gales and dangerous sea; in 42° N., 53° W., SE. to SW. and NW., stormy, high, confused sea; in 43° 32′ N., 47° 20′ W., SE., W. and SW., fresh to whele gale, with squalls of rain; in 46° 30′ N., 47° 40′ W., passed large icebergs from 40 to 50 feet high. 12th, in 39° 10′ N., 31° 55′ W., 29.89, WSW., force 7, cloudy; in 36° 10′ N., 32° 15′ W., 30.02, W., force 5, confused sea; in 50° 39′ N., 33° 17′ W., 29.35, SSE., force 2, drizzling rain; in 44° 11′ N., 44° 06′ W., 29.46, NNW., force 7, very heavy sea; in 43° N., 52° W., WNW., whole gale; in 43° N., 50° W., NW., heavy gale; in 47° N., 40° W., S. and W., fierce gale, tremendous sea, with heavy rain squalls; in 46° 32′ N., 40° 19′ W., W. and NW., heavy gale, dangerous sea; in 50° 39′ N., 33° 17′ W., 29.20, SE. by S., strong gale, with rain squalls. 13th, a. m., in 47° 25′ N., 27° 42′ W., SW., strong gale, increasing to nearly a hurricane; 3 p. m., terrific squall from the W., the gale from the S. not ceasing until the squall was upon the vessel without any warning whatever; hurricane from the SW. continued for about one hour with a tremendous sea, completely engulfing the ship; 7 p. m., hurricane from SW. slightly diminished in force, which continued to wane until a moderate westerly gale was reached at 4.30 a. m. of 14th. In 52° 17′ N., 27° 14′ W., 29.21, violent SE. by E., gale; in 45° 30′ N., 43° 26′ W., NW., strong gales, violent squalls; in 49° N., 41° W., SW., strong gale, high sea, heavy rain squalls; in 45° N., 44° W., NW.. fierce gale, tremendous sea, with rain squalls; in 44° N., 43° W., NW., very heavy gale; in 41° 47′ N., 28° 30′ W., 29.53, SW., force 9, hail-storm; in 36° 15′ N., 35° 45′ W., 29.96, WNW., force 7, showery; in 50° 47′ N., 21° 15′ W., 29.81, WSW., force 5, heavy rain for one hour; in 42° 58′ N., 42° 57′ W., 29.76, WNW., force 6, cloudy. 14th, in 36° 05′ N., 39° 05′ W., 30.04, W., force 6, showery; in 43° 24′ N., 25° 20′ W., 29.83, SW., force 5, cloudy; in 53° 46′ N., 20° 38′ W., 29.71, ESE, force 5, fair; in 49° 49′ N., 26° 55′ W., 29.37, WSW., force 6, heavy rain for two hours; in 44° 26′ N., 37° 01′ W, 29.58, WNW., force 6, cloudy; in 42° 28′ N., 49° 31′ W., 29.97, NNW., force 7, very heavy westerly sea, cloudy; in 50° N., 25° W., WSW., strong gale, high sea; in 48° 50′ N., 25° 45′ W., 29.42, WSW., force 6, tremendous sea, violent squalls of hail and snow; in 44° 30′ N., 46° 10′ W., NW., fierce gale, high sea; in 48° N., 36° W., NW., strong gale and high sea, heavy squalls of hail and snow; in 43° N., 47° W., NW., fierce gale, tremendous sea, snow squalls; in 42° N., 45° W., NW., very heavy gale. 15th, in 47° N.; 40° W., NW. and W., severe gales, high sea, violent squalls of snow and hail; in 43° 37′ N., 48° 08′ W., icebergs; in 45° N., 53° W., large fields of slab ice; in 45° 27′ N., 22° 12′ W., 29.63, SW., force 5, showery; in 36° N., 42° 55′ W., 30.10, WSW., force 2, overcast; in 45° 37′ N., 31° 14′ W., 29.62, NW., force 3, cloudy; in 48° 17′ N., 32° 27′ W., 29.56, W., force 4, hail and snow squalls. 16th, in 46° 50′ N., 19° 10′ W., 29.64, SW., force 5, showery; in 49° 23′ N., 13° 36′ W., 29.55, WSW., 4, moderate westerly sea; in 49° N., 20° W., SE. to NW., stormy, with squalls of rain. During this day and the following the depression filled up off the western coast of the British Isles under the influence of a high-pressure area, 30.20 to 30.40, prevailing over those islands. No. XI.—This depression developed in western Dakota on the 8th as secondary area to No. IX. On the morning of the 9th was central in the northern portion of the Upper Lake region, inclosed by the isobar of 29.80. 10th, central in the Lower Saint Lawrence Valley with diminished energy. During the day the depression passed eastward over the Canadian maritime provinces and on the following morning combined with area of No. X, then central southeast of Newfoundland. No. XIII.—This depression developed during the 13th in the Lower Missouri Valley, and on the following morning was central in the Province of Ontario as an area of very slight energy, inclosed by the isobar of 30.00. During the day the depression passed rapidly southeastward over the Lower Lake region, disappearing off the New England coast, and by the morning of the 15th became central in about 40° N., 55° W.; in 44° 26′ N., 52° 58′ W., 29.96, NW., force 6; in 42° 04′ N., 53° 40′ W., 29.36, NE., force 6. 16th, in 44° 28′ N., 46° 20° W., NW. gale, high sea, with violent squalls; in 46° 30′ N., 38°

08′ W., 29.37, NW., force 7, heavy snow and hail for three hours. 17th, in 47° 15′ N., 39° 15′ W., S., force 3, heavy sea; in 48° 19′ N., 18° 52′ W., 29.23, S., force 3, heavy rain; Angra, Azores, 29.56, a fall of 0.16 inch, W., light rain; in 37° N., 39° W., 29.54, SSW., force 3; in 49° 14′ N., 15° 15′ W., 29.56, SE., force 9, high confused sea; in 45° 08′ N., 43° 02′ W., 29.77, NNW., force 4, rain for three hours; in 48° N., 29° W., SW. to NW., severe gale, high sea; in 50° N., 26° W., SW., SE., and SSW., hard gale with squalls and showers; in 49° N., 29° W., SW., and S., strong gales, finally increased to heavy gale from the W., causing severe damage to vessel. 18th, in 50° 55′ N., 11° 57′ W., 29.89, ESE., force 6, misty; in 48° 02′ N., 24° 14′ W., WSW., force 2, high sea, rainy weather. During this day and the following the depression slowly filled up over the Bay of Biscay, under the influence of high pressures extending thence from western Europe. No. XVI.—This depression passed northward from the Gulf of Mexico during the latter part of the 14th, and on the following morning was central in Louisiana, inclosed by the isobar of 29.90. During this day and the following the depression passed northeastward over Alabama, Tennessee, and Virginia, reaching the Atlantic coast at about parallel 40° N., on the afternoon of the 16th. By the morning of the 17th the depression became central in about 40° N., 60° W. In 41° 05′ N., 63° 44′ W., 29.54, N., force 4, cloudy. 18th, in 53° 36′ N., 49° 19′ W., 29.20, NNW., force 7, heavy rain for two hours; in 35° 55′ N., 54° W., 29.84, NW., force 6, very high sea, violent squalls; in 43° N., 45° W., NW., strong gale, high sea; in 48° N., 34° W., W. and S., severe gales with frightfully high sea; in 48° N., 33° W., NW., strong gale, high sea; in 49° N., 31° W., W. and NW., fresh gale, squalls, showers, and high seas. 19th, in 52° 32′ N., 27° 05′ W., 29.00, S., force 6; in 44° 11′ N., 45° 28′ W., 28.86, NW., force 10, tremendous sea; in 47° N., 38° W., S., SE., and NW., tremendous gales and very high sea; in 48° N., 36° W., W., SSW., and N., strong gales, squally, showers, and high sea; in 47° N., 37° W., WSW. to NW., heavy gale, very high sea; in 47° 40′ N., 37° 30′ W., S., very heavy gale and tremendous high seas; in 46° 57′ N., 29° 44′ W., 29.37, WSW., force 6, heavy rain, very high sea. 20th, in 54° 17′ N., 19° 46′ W., 29.79, S., force 5. During this day and the following the depression filled up off the western coast of the British Isles; the pressure at land stations ranged from 30.20 to 30.46. No. XVII.—This depression entered the North Pacific Coast region on the 16th, and passing then southeastward to the Middle Plateau, was central near Salt Lake City on the morning of the 17th. On the 18th the depression passed eastward from the Lower Missouri Valley, and by the following morning became central in the western portion of the Middle Atlantic States. During the afternoon the center passed eastward off the coast, accompanied by heavy gales and high seas south of 40° N. and east of 72° W. 19th, in 38° 40′ N., 65° W., hurricane from NE., vessel hove on beam ends; in 37° N., 66° W., hurricane from SE. veering to NW. and lasting twenty-four hours; in about 39° 10′ N., 70° 15′ W., 9.30 p. m., terrific hurricane from NW., lasting one hour, vessel hove on beam ends and finally abandoned; in 30° N., 61° W., terrific SE. storm, which veered around to SW. and NW., barometer 29.31, tremendous sea washing away everything moveable on deck; in 34° N., 71° W., strong gale from NW. and N., with hail and snow squalls; in 37° N., 69° W., during night, violent hurricane from WSW., scud under bare poles for three hours, decks swept. On the morning of the 20th the depression became central in about 40° N., 60° W. In 36° 10′ N., 61° 25′ W., 29.36, W., force 8, misty; in 42° 07′ N., 59° 57′ W., 28.77, NNW., force 9, very heavy sea, cloudy; in 40° 01′ N., 63° 04′ W., 28.53, WNW., force 10, moderate rain, tremendous sea, terrific storm; in 41° N., 64° W., NE. heavy gale, high sea; in 38° N., 63° W., terrible hurricane from SE. to NW., lasting eighteen hours, followed by a heavy sea, washing everything off deck; in 42° 07′ N., 59° 57′ W., 28.82, NNW., force 11, violent gales and squalls; in 40° 01′ N., 63° 04′ W., 28.53, N. by W., force 12, terrific gales and squalls; in 41° N., 60° W., hurricane lasting twenty-four hours, decks swept by heavy cross seas; in about 34° N., 65° W., terrific hurricane from NW., lasting thirty-six hours, everything movable on decks swept off; in 43° N., 55° W., ESE., strong gale, high sea; in 47° N., 40° W., NW., hard gale, squalls, showers, and high sea; in 46° N., 40° W., NW., heavy gale, very high sea; in 42° 47′ N., 56° 54′ W., 28.55 W. by S., force 11, terrible storm; in 38° N., 62° W., tremendous gale, vessel on beam ends, and three men washed overboard; in 37° 10′ N., 58° 30′ W., hurricane from S. to NW., vessel abandoned; in 38° N., 62° 50′ W., 9 a. m., hurricane from ESE. to SSW., heavy seas; 3 p. m., gale increasing; midnight, vessel complete wreck. 21st, in 43° N., 50° W., E. and NW., shifting strong winds, heavy storm; in 43° N., 48° W., winds shifting from S. to E., soon increasing to a heavy gale, after which shifted from W. to NE.; in 42° 36′ N., 41° 34′ W., severe SW. gale carried away masts, swept decks, vessel finally abandoned; in 40° 17′ N., 46° 35′ W., severe gale from W., lasting seventy-two hours; in 36° 25′ N., 63° 40′ W., 29.88, WNW., force 3, showery; in 40° 27′ N., 65° 55′ W., 29.79, SE., force 2, light rain for three hours; in 40° 47′ N., 56° 26′ W., 29.58, N., force 7, very high northerly sea; in 44° 59′ N., 37° 52′ W., S., force 5, heavy rain, very high sea. 22d, in 44° 11′ N., 40° 24′ W., 29.46, NNE., force 8, heavy rain, very high sea; in 42° 14′ N., 50° 01′ W., 29.46, force 5, snow squalls, high sea; in 43° N., 50° W., N., strong gale, very high sea; in 42° 30′ N., 48° W., passed three small icebergs; in 43° N., 49° 36′ W., icebergs. 23d, in 50° 16′ N., 23° 43° W., 29.41, S., force 5, light rain; in 43° 23′ N., 44° 32′ W., 29.42, WNW., force 6, heavy rain and high sea; in 44° 36′ N., 42° 15′ W., 29.28, NW., force 7, sleet, squally, very high sea; in 43° 20′ N., 49° W., floe ice extending north and south as far as the eye could reach; in 43° 39′ N., 47° 42′ W., icebergs, some 30 feet high. 24th, in 48° 55′ N., 31° 16′ W., 29′06, E., force 2, cloudy; in 47° 02′ N., 36° 01′ W., 29.35, WNW., force 6, squally, very high sea; in 42° 39′ N., 49° 22′ W., 29.81, NNW., force 3, snow squalls. 25th, in 49° N., 28° 55′ W., WNW., force 6, squally, very high sea; in 47° 20′ N., 37° 16′ W., 29.61, WNW., force 4, light rain; in 46° N., 36° W., NW., strong, very high sea, ship labored heavily. 26th, in 50° 29′ N., 20° 35′ W., 29.60, S., force 6, raining. 27th, central off the northern coast of Spain; in 46° 17′ N., 7° 16′ W., 29.84, NE., force 4, drizzling; Bilbao, 29.88, a fall of 0.11 inch, SE., fair; Santiago, 29.76, a fall of 0.02 inch, SE., cloudy; Madrid, 29.84, a fall of 0.15 inch, SE., cloudy. During the 26th and 27th, rain, with SE. to SW. winds, prevailed throughout Spain. 28th, depression central in southern Spain, lowest barometer at Murcia, 29.72, ESE., raining; Madrid, 29.93, a rise of 0.09 inch, NE., raining. 29th, central in northeastern Algeria; Biskra, 29.55, a fall of 0.13 inch, SE., force 5, cloudy; Tebessa, 29.63, a fall of 0.17 inch, S., force 7, fair; La Calle, 29.60, a fall of 0.17 inch, NE., force 2, threatening. 30th, depression central over Sicily, inclosed by the isobar of 29.60. During this day and the following disappeared to the southward over the Mediterranean. No. XX.—This depression appeared in the vicinity of Hudson's Bay on the 18th, and by the following morning was central south of York Factory, barometer 29.30, a fall of 0.29 inch, N., 27 miles per hour, drifting snow. During the 20th the depression passed rapidly southeastward over Canada and northern New England, accompanied by threatening weather and snow in the former. By the morning of the 21st the depression became central over the ocean southwest of Nova Scotia, combining thereafter with area No. XVII. No. XXI.—Appearing northwest of Manitoba on the 20th, this depression passed southeastward over that region during the day. 21st, central north of Lake Superior, inclosed by the isobar of 30.00; lowest barometer at Marquette, 29.94, a fall of 0.16 inch, W., cloudy. 22d, central in the Lower Saint Lawrence Valley, inclosed by the isobar of 29.90. During the day the depression disappeared to the eastward over the Gulf of Saint Lawrence. No. XXII.—This depression appeared in Manitoba on the 22d; Fort Garry, 29.68, a fall of 0.35 inch, SE., 16 miles per hour, cloudy; Pembina, 29.60, a fall of 0.38 inch, S., fair. 23d, depression central north of Lake Huron, Parry Sound, 29.64, a fall of 0.30 inch, SE., heavy snow; Alpena, 29.60, a fall of 0.43 inch, W., fair; Rockliffe, 29.69, a fall of 0.21 inch, E., threatening. 24th, depression central off the New England coast, followed by northwesterly winds and snow westward to the Lake region, and northeasterly winds with cloudy and threatening weather in the Canadian maritime provinces. Portland, Me., 29.45, a fall of 0.46 inch, W., fair; Boston, 29.55, a fall of 0.43 inch, NW., fair; Eastport, 29.62, a fall of 0.18 inch, E., 22 miles per hour, cloudy; Quebec, 29.74, a fall of 0.15 inch, E., gale, heavy snow. The following reports show the severity of the storm over the ocean: In 37° 15′ N., 70° 50′ W., 29.75, NW., force 6, overcast; in 39° 49′ N., 72° W., 29.72, NW., force 6; in 39° 10′ N., 67° W., terrific gale from NW., accompanied by heavy rain and thunder with vivid lightning, heavy cross sea sweeping decks; off Barnegat, N. J., severe gale from S., lasting twenty-four hours; 40 miles ESE. of Cape Cod, violent gale from WNW., with heavy cross sea; in 37° 26′ N., 61° W., SW. strong gale, with heavy squalls, increasing to heavy gale with high cross sea. 25th, in 33° N., 72° W., violent SW. to NW. storm, vessel struck by lightning; in 41° N., 67° W., SE., NW., and N., strong gales, snow squalls, high sea; in 41° 40′ N., 62° W., variable, heavy gales, snow squalls, hard frost, very high sea; in 45° 25′ N., 49° W. (from Cardiff to New York), up to this position vessel had passed through 180 miles of ice, encountered heavy drift ice, and over 100 icebergs; in 37° 05′ N., 66° 25′ W., 29.76 W., force 8, squally; off Sandy Hook, 30.21, NW., force 4, squally; in 42° 02′ N., 54° 52′ W., 29.34, W., force 4, very high sea, rainy. 26th, in 36° 28′ N., 41° 24′ W., 29.97, SW., force 6, raining; in 37° N., 62° 10′ W., 29.84, WNW., force 7, very high sea, hailing; in 45° 28′ N., 43° 23′ W., 29.35, SSW., force 4, light rain; in 41° 34′ N., 58° 23′ W., 29.47, NW., force 6, very high sea, rain squalls; in 43° N., 53° W., westerly gale, rain squalls; in 39° N., 61° W., fearful NW. gale. 27th, in 36° 34′ N., 71° 30′ W., violent southwest gale, lost sails and boats; in 37° N., 47° W., hurricane from SW. to NW., lasting thirty-six hours, barometer fell to 28.70, decks swept; in 38° 54′ N., 38° 35′ W., 29.98, SW., force 6, drizzling; in 37° 05′ N., 57° 40′ W., 30.03, W., force 7, very high sea, cloudy; in 43° 13′ N., 49° 27′ W., 29.51, W., force 2, light rain; in 40° 02′ N., 62° 05′ W., 29.98, WNW., force 5, snow squalls. 28th, depression central in about 50° N., 40° W., inclosed by the isobar of 29.80. 29th, in 53° N., 27° W., S. to W. strong gale; in 52° 50′ N., 26° 35′ W., 29.66, NNW., force 3, fair. 30th, in 51° 49′ N., 30° 43′ W., 29.45, NW., force 6, very heavy sea, fair weather; Stykkisholm, Iceland, 29.01, a fall of 0.78 inch, SE., force 9, snowing. 31st, depression central west of Iceland; Stykkisholm, 28.57, a fall of 0.44 inch, SE., force 2, snowing; Thorshavn, 29.03, a fall of 0.65 inch, SE., force 9, raining; Godthaab, 29.71, a rise of 0.11 inch, NNW., force 4, snowing. Throughout the northern portion of the British Isles the pressure fell from 0.20 to 0.60 inch, and the winds shifted to south and southeast, with velocities ranging from 20 to 50 miles per hour. The continuation of this storm will appear upon Chart No V for April, 1880. No. XXV.—This depression entered the coast of British Columbia on the 24th; in 40° 54′ N., 133° 02′ W., 29.58, NW., force 6, fair; in 48° 21′ N., 124° 04′ W., 29.49, ESE., force 6, threatening; Olympia, 29.60, a fall of 0.26 inch W., cloudy. 25th, depression central in the Northern Plateau; Boisé City, 29.87, NW., cloudy; Winnemucca, 29.74, a fall of 0.07 inch, W., light snow; Salt Lake City, 29.70, a fall of 0.18 inch, SE., clear. 26th, depression central in the southern portion of the Northern Rocky Mountain region. Cheyenne, 29.46, a fall of 0.34 inch, W., clear; North Platte, 28.99, a fall of 0.51 inch, S., hazy; Dodge City, 29.09, a fall of 0.26 inch, S., cloudy. 27th, depression central in the Upper Mississippi Valley, inclosed by the isobar of 29.00. Saint Louis, 29.16, a fall of 0.62 inch, SE., fair; Keokuk, 28.93, a fall of 0.77 inch, W., cloudy; Davenport, 28.91, a fall of 0.89 inch, SE., light rain; Des Moines, 29.16, a fall 0.47 inch, NW., light rain. During the day the depression passed rapidly eastward over the Ohio Valley and Middle Atlantic States, and by the morning of the 28th became central off the Atlantic coast in about 40° N., 70° W. Heavy southwest to northwest gales, ranging from 30 to 60 miles per hour, prevailed at coast stations between the parallels of 34° and 40° N.; northward to 45° N., northeasterly gales prevailed. In 33° N., 72° 10′ W., 29.57, SW., hurricane, very high sea, raining; in 42° 28′ N., 54° 57′ W., 29.62, S., force 1, heavy rain during past twenty-four hours, hazy; in 40° 55′ N., 66° 30′ W., 29.10, SW., force 2, heavy rain in past twenty-four hours, very high sea, misty; in about 34° N., 73° 40′ W., 29.30, WSW., force 5; in 34° 49′ N., 75° 27′ W., 29.49, W., force 3, very rough sea; in 34° 49′ N., 75° 27′ W., 29.56, violent westerly gale; in 42° N., 63° W., rain and sleet, very unsettled weather with high SW. sea, heavy westerly gale, with cross seas; in 36° N., 60° W., very heavy westerly gale. 29th, in 33° 45′ N., 70° 10′ W., 29.48, NW., force 7, very high sea, raining; in 39° 40′ N., 49° 15′ W., 29.79, SW., force 7, very high sea, overcast; in 41° 48′ N., 59° 35′ W., 29.22, WNW., force 4, very rough sea, cloudy; in 40° 10′ N., 72° 49′ W., 29.66, NE., force 4, cloudy; in 35° 31′ N., 74° 35′ W., 29.66, NNW., force 5, very rough sea, threatening; in 42° N., 61° W.,, very heavy storm from SW. , tremendous gale, very high sea; in 41° 39′ N., 60° W., SW. to NW., strong gale, very high sea; in 42° N., 59° W., 29.28, heavy westerly gales. 30th, in 43° 27′ N., 43° W., violent westerly gale, dense fog; in 34° N., 67° 50′ W , 29.31, N., force 8, very high sea, raining; in 40° 50′ N., 45° W., 29.93, SSW., force 5, high sea, rain and fog; in 40° 57′ N., 66° 40′ W., 29.39, NE., force 6, light rain, very rough sea; in 35° 21′ N., 73° 18′ W., 29.76, N., 35 miles per hour, very rough sea, stormy. 31st, in 33° 25′ N., 65° 20′ W., 29.68, WNW., force 6, very high sea, showery; in 42° 05′ N., 40° 55′ W., 29.98, S., force 4, foggy; off Sandy Hook, 29.75, NW., force 3, clear; Little Glace Bay, N. S., 29.20, a fall of 0.70 inch, SE., 10 miles, raining; Sidney, C. B., 29.26, a fall of 0.65 inch, NE., 14 miles, sleeting; Windsor, N. S., 29.35, a fall of 0.56 inch, N., 29 miles, cloudy; Charlottetown, Prince Edward Island, 29.41, a fall of 0.47 inch, N., 30 miles, light snow. The continuation of this storm will appear on Chart No. V for April, 1880. No. XXVI.—This depression appeared off the coast of Washington Territory on the 27th, accompanied by light to heavy rains, with southerly winds in the North Pacific Coast region. 28th, depression central in the Northern Plateau, inclosed by the isobar of 29.80. Winnemucca, 29.73, a fall of 0.24 inch, SW., 40 miles per hour, cloudy. During the day the depression remained about stationary, but on the 29th it passed quite rapidly southeastward, and by the morning of the 30th became central in the Middle Rocky Mountain Slope. North Platte, 29.30, a fall of 0.35 inch, E., cloudy; Dodge City, 29.36, a fall of 0.32 inch, SE., clear. Changing its course to the northward during the day, the depression on the morning of the 31st became central in the northern portion of the Upper Mississippi Valley, inclosed by the isobar of 29.80, and accompanied by southerly winds and light rain. The continuation of this storm will probably appear on Chart No. V for April, 1880. Of the storms entering northern Europe the following are briefly described. No. II.—The barometer remained low north of the British Isles after the passage eastward of area No. XVI, Chart No. V, for February, 1880, and on the morning of the 1st an area of 28.40 embraced the Orkney and Shetland Islands. North Unst, 28.21, a fall of 0.64 inch, SW., force 8, cloudy. Barometer at all stations in northern Scotland below 28.90, and throughout the remainder of the British Isles below 29.40; winds southwesterly and ranging in velocities from 20 to 45 miles per hour. During the 1st and 2d the depression remained about stationary, but on the 3d moved slowly eastward into southern Norway, where it became central on the morning of the 4th with diminished energy and higher pressure. Bergen, 29.03, a rise of 0.27 inch, WNW., fair;

Christiania, 29.11, a rise of 0.26 inch. SSE., foggy; Wisby, 29.16, a rise of 0.13 inch, NW., force 4, cloudy; North Unst, 29.09, a rise of 0.56 inch, NW., force 6, fair. During the day the depression moved rapidly eastward over the Baltic into western Russia, becoming central on the morning of the 5th southeast of the Gulf of Finland. St. Petersburg, 29.35, a rise of 0.69 inch, NNE., raining; Moscow, 29.24, a fall of 0.18 inch, S., snowing; Kieff, 29.44, a fall of 0.07 inch, NW., 18 miles, cloudy; Lugan, 29.38, a fall of 0.53 inch, SSE., cloudy. During the day the depression remained about stationary, and continued a sluggish movement eastward with diminishing energy, until the 8th, when combining with No. VII near the Ural Mountains, the central area became inclosed by the isobar of 29.00 and the intensity of the storm greatly augmented. Kasan, 29.09, a fall of 0.54 inch, SW., 7 miles, snowing; Ekaterinburg, 28.92, a fall of 0.70 inch, NNW., cloudy. 9th, depression central in the valley of the Obi. Ekaterinburg, 29.13, a rise of 0.21 inch, N., snowing; Barnaul, 29.71, a rise of 0.02 inch, SW., cloudy; Yeniseisk, 29.33, a fall of 0.54 inch, WSW., 25 miles, rain and snow. 10th, depression central in the valley of the Yenisei. Yeniseisk, 29.61, S., 7 miles, cloudy. During the day the depression disappeared to the eastward over northern Siberia. No. III.—This depression appeared in northwestern Russia on the 1st as a continuation of area No. XVI of Chart No. V for February, 1880. 1st, Archangel, 28.86, a rise of 0.17 inch, S., light snow; Kasan, 28.94, a fall of 0.66 inch, S., 13 miles, cloudy; Moscow, 29.28, a rise of 0.18 inch, ESE., thirteen miles, cloudy; Ekaterinburg, 29.48, a fall of 0.30 inch, S., nine miles, snowing. 2d depression central east of the Ural Mountains. Ekaterinburg, 29.38, a fall of 0.10 inch, W., 7 miles, snowing. 3d, Barnaul, 29.86, a fall of 0.23 inch, SW., 13 miles, light rain; Ekaterinburg, 29.90, a rise of 0.52 inch, SW., cloudy. During the day the depression disappeared east of the Yenisei. 4th, Yeniseisk, 30.10, SW., clear; Barnaul, 30.31, SW., cloudy. No. V.—This depression appeared on the 3d over eastern Lapland. Archangel, 28.69, a fall of 0.39 inch, SSW., thirteen miles, cloudy. 4th, depression central between the Gulf of Finland and the White Sea. Saint Petersburg, 28.96, a fall of 0.19 inch, SSW., light rain; Dorpat, 29.00, a fall of 0.19 inch, WSW., cloudy; Moscow, 29.42, a fall of 0.19, inch, E., cloudy. On the 5th this depression combined with area No. II. No. VII.—This depression appeared off the northwestern coast of Norway on the 5th, becoming central on the following morning in northern Scandinavia inclosed by the isobar of 29.20; Tromso, 29.19, a fall of 0.23 inch, NE., 34 miles, snowing; Brono, 29.55, a fall of 0.10 inch, NW., 22 miles, cloudy; Bergen, 29.69, a fall of 0.02 inch, S., 17 miles, raining; Haparanda, 29.46, a fall of 0.22 inch, S., force 4, cloudy. 7th, central over the White Sea. Archangel, 29.24, a fall of 0.49 inch, SSW., snowing; Saint Petersburg, 29.42, a fall of 0.42 inch, WSW., snowing. On the 8th this depression combined with area No. II, then central in eastern Russia. No. XII.—This depression entered northern Scandinavia on the 9th. Tromso, 29.15, a fall of 0.65 inch, SE., raining; Haparanda, 29.30, a fall of 1.05 inches, W., force 6, clear; Archangel, 29.44, a fall of 0.37 inch, cloudy. 10th, depression central in Finland. Archangel, 29.08, a fall of 0.36 inch, E., 13 miles, snowing; Saint Petersburg, 29.42, a fall of 0.28 inch, W., 18 miles, cloudy; Haparanda, 29.40, a rise of 0.10 inch, NW., force 6, clear. 11th, depression central in about 60° N., 60° E., inclosed by the isobar of 29.00. Ekaterinburg, 28.84, a fall of 0.63 inch, SW., 31 miles, drifting snow; Kasan, 29.10, a fall of 0.44 inch, NNW., 20 miles, cloudy; Archangel, 29.63, a rise of 0.55 inch, NW., 13 miles, cloudy. 12th, depression central with diminished energy in the valley of the Obi, disappearing during the day over northern Siberia. No. XIV.—This depression appeared east of the White Sea on the 14th, inclosed by the isobar of 29.60. On the 15th a barometric trough of 29.60 ran southeastward to the Caspian Sea. 16th, central in eastern Russia near Kasan, barometer 29.40, a fall of 0.35 inch, SSE., cloudy; Ekaterinburg, 29.45, a fall of 0.42 inch, E., cloudy. During the 17th and 18th the depression remained about stationary in this region with slowly rising pressure at the center. 19th, central in the valley of the Obi, with rapidly increasing pressure, and by the following morning had disappeared in a high pressure area, 30.40 over western Siberia. No. XIX.—This depression appeared to form south of the Gulf of Finland on the 19th. Saint Petersburg, 29.55, a fall of 0.46 inch, N., 16 miles, cloudy; Dorpat, 29.69, a fall of 0.51 inch, N., 20 miles, cloudy; Moscow, 29.54, a fall of 0.32 inch, SSE., 13 miles, light snow; Wilna, 29.87, a fall of 0.41 inch, WSW., snowing. 20th, Moscow, 29.59, a rise of 0.05 inch, N., cloudy; Wilna, 30.01, a rise of 0.14 inch, N., heavy clouds; Kieff, 29.71, a fall of 0.20 inch, NW., cloudy; Kasan, 29.56, a rise of 0.02 inch, SSE., light snow. 21st, depression central north of the Caspian Sea. Astrakhan, 29.67, a fall of 0.46 inch, N., heavy clouds; Tiflis, 29.64, a fall of 0.50 inch, SW., cloudy. During the day the course of the storm changed to the northeast and by the following morning the depression was central in the valley of the Obi. Ekaterinburg, 29.53, a fall of 0.11 inch, WSW., cloudy; Barnaul, 29.80, a fall of 0.44 inch, calm, cloudy. 23d, central in the valley of the Yenisei, north of parallel 60° N. Yeniseisk, 29.02, a fall of 1.05 inches, SSE.; 11 miles, snowing. The continuation of this depression could not be traced owing to the lack of reports from northern Siberia. No. XXIV.—This depression appeared over Finland, on the 23d, and by the morning of the 24th had passed eastward to about 60° N., 40° E. Archangel, 29.24, a fall of 0.34 inch, WNW., 18 miles, cloudy; Moscow, 29.67, a fall of 0.45 inch, W., cloudy; Kasan, 29.56, a fall of 0.25 inch, SW., 31 miles, cloudy; Ekaterinburg, 29.46, a fall of 0.05 inch, SW., 27 miles, drifting snow. 25th, a barometic trough of 29.60 extended from about 60° N., 60° E., southwestward across Russia to the Black Sea; lowest barometer at Kasan, 29.47, a fall of 0.09 inch, SSE., snowing; Moscow, 29.60, a fall of 0.07 inch, N., snowing; Nikolaiev, 29.92, a fall of 0.44 inch, NNW., 31 miles, sleeting. 26th, depression central in about 60° N., 50° E. Archangel, 29.35, a fall of 0.54 inch, W., 22 miles, snowing; Kasan, 29.58, a rise of 0.11 inch, SSE., snowing. 27th, central in about 60° N., 60° E. Ekaterinburg, 29.27, a fall of 0.41 inch, SW., cloudy; Kasan, 29.31, a fall of 0.27 inch, SSW., cloudy. 28th, central in the valley of the Obi. Ekaterinburg, 29.15, a fall of 0.12 inch, SSW., 18 miles, snowing. During the day this depression disappeared in western Siberia, under the influence of a high-pressure area, 30.20. No. XXVIII.—After the disappearance of area No. XXIV the pressure still remained low north of 60° N. and between the parallels of 40° and 60° E. 29th, Archangel, 29.39, WNW., 22 miles, light snow; Kasan, 29.36, NW., 22 miles, cloudy; Ekaterinburg, 29.44, SW., cloudy. 30th, depression central with diminished energy in northeastern Russia, inclosed by the isobar of 29.80. 31st, depression disappeared in northwestern Siberia, under the influence of a high-pressure area, 30.20. Concerning the storms off the Asiatic coast the following brief descriptions are given: No. XV.—On the morning of the 15th the barometer at Pekin read 29.80, a fall of 0.31 inch, SW., clear. 16th, depression central over the Japan Sea; barometer at Japanese stations fell from 0.08 to 0.15 inch, with cloudy and rainy weather. During the day the depression disappeared eastward over the ocean. No. XVIII.—This depression appeared over the Yellow Sea on the 18th and by the following morning became central north of the Island of Nippon. 19th, Wakayma, 29.32, a fall of 0.70 inch, S., 20 miles per hour, 1.37 inches rainfall in past twenty-four hours, cloudy; Tokei, 29.59, a fall of 0.48 inch, S., 20 miles per hour, 1.54 inches rainfall in past twenty-four hours, light rain; Hiroshima, 29.56, a fall of 0.46 inch, N., 16 miles per hour, 0.91 inch rainfall in past twenty-four hours, fair; Nagasaki, 29.81, a fall of 0.19 inch, WNW., 1.02 inches rainfall in past twenty-four hours, clear; 20th, depression central over the ocean, followed at land stations by a rise in barometer of from 0.30 to 0.85 inch, winds shifting to northerly, with clearing weather. No. XXIII.—This depression was probably central southeast of the Leu Cheu Islands on the 22d. By morning of the 23d, in pursuing a course northeastward, the depression had reached a position north of the Bonin Islands. At most stations on the Island of Nippon the winds shifted to northerly, with rapidly falling barometer. Tokei, 29.58, a fall of 0.67 inch, NNW., 15 miles per hour, 1.05 inches rainfall in past twenty-four hours, light rain; Wakayama, 30.05, a fall of 0.11 inch, NNW., fair; in 33° 44′ N., 137° 57′ E., 29.70 NW., force 6, rough sea, squally weather. 24th, Tokei, 30.08, a rise of 0.50 inch, NNW., clear; Wakayama, 30.28, a rise of 0.23 inch, N., clear; Hiroshima, 30.33, a rise of 0.11 inch, NNE., clear; Nagasaki, 30.37, a rise of 0.11 inch, NNE., clear. During the day the depression disappeared eastward over the ocean. No. XXVII.—This depression appeared in southeastern China on the 28th. Steamship Monocacy, U. S. N., at Shanghai, barometer 29.80, a fall of 0.22 inch, S., force 1, clear; steamship Palos, U. S. N., at Shanghai, barometer 29.83, a fall of 0.22 inch, SSE., force 2, cloudy. 29th, position of central disturbance uncertain, probably south of the Island of Kinsin. Hiroshima, 29.98, a fall of 0.03 inch, NNE., fair; Nagasaki, 30.01, N., threatening; Tokei, 29.65, a fall of 0.35 inch, NW., 13 miles, 1.22 inches rainfall in past twenty-four hours, raining; Wakayama, 29.86, a fall of 0.19 inch, NW., cloudy. 30th, Hiroshima, 29.88, a fall of 0.10 inch, W., fair; Nagasaki, 29.87, a fall of 0.14 inch, SE., clear; Tokei, 30.05, a rise of 0.40 inch, ENE., cloudy; Wakayama, 29.94, a rise of 0.08 inch, N., cloudy. 31st, Hiroshima, 29.88, no change, N., fair; Nagasaki, 29.99, a rise of 0.12 inch, WNW., clear; Wakayama, 29.73, a fall of 0.21 inch, WNW., 13 miles, clear; Tokei, 29.43, a fall of 0.62 inch, 17.78 m. m. rainfall in past twenty-four hours, cloudy. April 1st, Hiroshima, 30.03, a rise of 0.15 inch, NNE., clear; Wakayama, 30.01, a rise of 0.28 inch, N., cloudy; Tokei, 29.87 a rise of 0.44 inch, NNW., clear. During the previous day the depression disappeared eastward over the ocean.

Ocean ice.—January 30, 1882. In 47° 30′ N., 48° 35′ W., steamship Glamorgan passed large iceberg about forty feet high. On February 1st, the same steamer passed in 46° 43′ N., 52° 24′ W., a great quantity of field ice extending forty miles in length. 9th, in 47° 30′ N., 47° W., steamship Averill reported a large quantity of field ice and several large icebergs. 11th, in 46° 30′ N., 45° 30′ W., steamship Australia passed through large quantities of field ice and saw several icebergs; in 46° 34′ N., 48° 37′ W., steamship Pollax reported large quantities of field ice; in 47° 19′ N., 47° 18′ W., steamship Vandalia reported large quantities of field ice; in 46° N., 46° W., steamship Brooklyn

City saw large iceberg and four hours later large packs of ice. 15th, in 47° 05′ N., 44° 30′ W., steamship P. Caland passed large iceberg and considerable quantities of floating ice up to 45° 40′ N., 46° 43′ W. 16th, in 47° 50′ N., 46° 30′ W., steamship Thingvalla passed large quantities of field ice and several icebergs; in 46° 20′ N., 47° 18′ W., steamship Assyrian passed large iceberg. 17th, in 47° 10′ N., 46° 50′ W., steamship Ethiopia passed iceberg and large quantities of field ice. 18th, in 46° 20′ N., 45° 55′ W., in 46° N., 46° 55′ W., and in 46° 20′ N., 47° 16′ W., steamship Bolivia passed several large icebergs; in 45° 57′ N., 47° 54′ W., steamship The Queen passed large iceberg and field ice. 19th, in 46° 10′ N., 46° 30′ W., steamship Cimbria passed large quantities of field ice, vessel compelled to sheer south for twelve hours; in 47° 40′ N., 43° 28′ W., steamship State of Indiana passed large iceberg. 20th, in 46° 21′ N., 41° 40′ W., steamship Cornwall passed several large icebergs and some field ice; in 46° 30′ N., 47° 25′ W., steamship Plantyn passed iceberg about 100 feet in height, and four hours afterward a large ice island; brig Trusty at Trepassy from Crookhaven, passed 300 miles of drift ice off the coast of Newfoundland. 21st, in 45° 19′ N., 49° 58′ W., steamship Cornwall passed several large icebergs and some field ice.

TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of February, 1882, is exhibited by lines of equal thermometric mean values upon Chart No. II. The table of mean and comparative temperatures in the right-hand corner of the chart shows, in the first column, the average for the month throughout the various districts, as deduced principally from observations taken at Signal Service stations. In the two remaining columns are shown the means for the present month, and the departures of such means from the average for many years. The temperature is everywhere above the normal east of the 107th meridian, the departures of excess ranging from 2°.5 in New England to 9°.9 in the Upper Mississippi Valley. Six districts report a mean temperature which on the average is 8° or more above the normal. Throughout the remainder of the country the temperature is below the normal, the departures of deficiency ranging from 1°.7 in the Southern Plateau to 7°.2 in the Middle Plateau. All of the districts but one, comprising this area, report a mean temperature which on the average is nearly 6° below the normal. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1874, together with the corresponding districts: 1875,—17°, Minnesota and —15°.2 Upper Lake region; 1876, +4°.7 Lower Missouri Valley and +4°.6 Upper Missisisppi Valley; 1877, +13°.4 Minnesota, +11°.5 Upper Mississippi Valley and +10°.9 Lower Missouri Valley; 1878, +18°.7 Minnesota, +16°.4 Upper Missouri Valley and +13°.3 Upper Mississippi Valley; 1879, +8°.3 Salt Lake City, +7°.1 Tucson and —6°.4 Saint Lawrence Valley; 1880, +6°.5 Lower Lake Region, +6°.2 Middle Atlantic States and —5°.3 Northern Rocky Mountain Slope; 1881, —6°.0 Missouri Valley, —5°.0 Middle Rocky Mountain Slope and Upper Mississippi Valley and +6°.3 Salt Lake City.

Deviations from mean temperatures.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the right-hand side of Chart No. II. The following items of importance, in connection with this subject, are reported by voluntary observers: *Illinois:* Riley, mean temperature, the highest ever recorded at this place, being 10°.2 above the mean of February for the past twenty-one years, and 1°.6 above the highest monthly mean previously recorded, which occurred in 1878. Its maximum temperature has not been exceeded during that period, but was just equaled in February, 1861. Mean temperature of winter of 1881–2 is 27°.8 or 6°.8 above the average of the past nineteen winters; only the winters of 1870–1 and 1877–8 were warmer; the mean temperature of the winter of 1862–3 was just equal. The maximum temperature of past winter has only been exceeded once, viz: in December, 1877; the minimum of each winter during the past nineteen years has been lower than that of the past winter. *Indiana:* Vevay, mean temperature, 45°.52 or 10° above the average of the past seventeen years, and 19°.5 above the mean of the coldest month (February, 1875) which was reported during that period. Maximum temperature for February, 1882, is 5° lower than that of 1866 and 1869. *Iowa:* Clinton, mean temperature nearly 12° above the average. *Kansas:* Manhattan, mean temperature 40°.4 or 8°.09 above the average of the past 22 years; highest mean during that period, 39°.18, occurred in 1878, and the next highest, 36°.93, occurred in 1876. Wellington, mean temperature 40°.1 or 6°.2 above the average of the past three years. Lawrence, mean temperature 41°.65 or 8°.66 above the average of the past fourteen years; during that period the highest mean, 40°.22, occurred in 1878, and the lowest, 25°.78, occurred in 1881. Yates Center, mean temperature, 39°.6 or 9°.6 above the mean of the past two years. *Maine:* Gardiner, mean temperature 21°.13 or 0°.53 above the average of the past forty-six years. *Maryland:* Fallston, mean temperature, 36°.8, which is the highest, with the exception of 1880, that has occurred during the past twelve years. *Michigan:* Thornville, mean temperature fully 10° above the average of the past fifteen years. *Missouri:* Saint Louis, Missouri Weather Service reports mean temperature 43°.8 or 8°.6 above the average of the past forty-five years; 0°.3 below the mean of the warmest February, which occurred in 1845, and 23° above the mean of the coldest February, which occurred in 1838. *New Hampshire:* Contoocookville, mean temperature 25°.3 or nearly 3°.0 above the February average for the past twelve years. *New York:* North Volney, mean temperature 28°.39 or 6°.34 above the average of the past thirteen years; the highest February mean for that period, 27°.93, occurred in 1877, and the lowest mean, 13°.19, occurred in 1875; mean temperature for winter of 1881-'2 at 7 a. m., 25°.16; 2 p. m., 32°.47; 9 p. m., 27°.58; mean for winter, 28°.14; average winter mean for past thirteen years, 23°.21; highest winter mean, 28°.67, occurred in 1880; lowest winter mean, 17°.79, occurred in 1875. Palermo, mean temperature, 26°.4 or 5° above the average of February for the past twenty-nine years; during that period the highest mean, 27°.6, occurred in 1878; lowest, 12°.6, occurred in 1875. *Ohio:* Cleveland, mean temperature 37°.55, which has not been equalled or exceeded during the past twenty-seven years, and is 8°.56 above the average for that period; the lowest February mean 17°.01 occurred in 1875. *Pennsylvania:* Wellsborough, month will long be remembered as most exceptionally warm; mean temperature 32°.4 has not been equaled or exceeded during the past twenty years. *Texas:* Clarksville, mean temperature 59°.4, the highest that has occurred during the past twelve years. *Utah:* Coalville, mean temperature about 5° below the average of February for the past four years. *Vermont:* Woodstock, mean temperature 21°.42; mean for February from 1868 to 1882, inclusive, 16°.82; during that period the highest monthly mean, 23°.51 occurred in 1877 and the lowest 9°.67, occurred in 1875. *Virginia:* Wytheville, mean temperature 41°.97 or 5° above the average of the past 18 years and 5° above the highest monthly mean that occurred during that period. *West Virginia:* Helvetia, mean temperature 40°.6 or 3°.31 above the average of the past 6 years.

Ranges of temperature at Signal Service stations.—Monthly ranges in general varied from 40° to 60° over the country east of the Rocky Mountains, and from 45° to 80° westward to the Pacific. The smallest ranges are: San Francisco, 23°; Key West 24°; Port Eads, 31°; Punta Rassa and Sacramento, 32°; Atlantic City, Provincetown, Mass., Olympia and San Diego, 33°; Indianola, Cape May, New Shoreham, and Portland, Oreg., 35°. The largest are: Terry's Landing, 96°; Fort Benton, 5°; New Chicago, 90° Fort Sully, 89°; Smithville, Dak., 88°; Fort Stevenson, 87°; Fort Assinniboine, Rapid City and Fort Keogh, 86°; Bismarck, 84°; Fort Washakie, 82°; Fort Buford, 81°; Fort Shaw, 80°; Rock Creek, 79°; Fort Missoula, 78°; Saint Vincent, 77°; Huron and Helena, 75°; Fort Custer, 74°; Eagle Rock and North Platte, 72°; Yankton, 71°. The daily ranges varied in the different districts as follows: New England, 24° at Thatcher's Island to 33° at Boston and 37° at Burlington; Middle Atlantic States, 19° at Cape May to 27° at Williamsport and 30° at Sandy Hook, New York, and Albany; South Atlantic States 21° at Smithville to 27° at Charlotte and 33° at Augusta and Kittyhawk; Florida Peninsula, 15° at Key West to 22° at Punta Rassa and Cedar Keys; Eastern Gulf States, 21° at New Orleans to 25° at Vicksburgh and 29° at Montgomery; Western Gulf States, 20° at Galveston and Port Eads to 33° at Mason and 36° at Fort Gibson; Rio Grande Valley, 27° at Brownsville to 31° at Uvalde and 38 at Rio Grande; Ohio Valley and Tennessee, 24° at Champaign to 31° at Pittsburgh, Morgantown, and Cincinnati, and 33° at Knoxville; Lower Lake region, 21° at Detroit and Sandusky to 29° at Rochester and 33° at Cleveland and Oswego; Upper Lake region, 22° at Alpena to 26° at Milwaukee and 33° at Duluth; Upper Mississippi Valley, 24° at Keokuk to 30° at Des Moines, 32° at Saint Paul, and 36° at La Crosse; Missouri Valley, 25° at Springfield, Mo., to 31° at Omaha, 35° at Leavenworth, and 39° at Yankton; Extreme Northwest, 34° at Moorhead to 36° at Saint Vincent, 47° at Fort Stevenson and Bismarck and 48° at Fort Buford; Northern Slope, 37° at Cheyenne to 40° at Fort Keogh, 46° at North Platte and 59° at Fort Benton; Middle Slope, 22° on summit of Pike's Peak to 42° at Dodge City and Fort Elliott and 55° at West Las Animas; Southern Slope, 34° at Coleman City to 38° at Fort Griffin and Jacksborough and 43° at Henrietta and Stockton; Northern Plateau, 26° at Umatilla to 41° at Eagle Rock and 49° at Fort Missoula; Middle Plateau, 22° at Salt Lake City to 32° at Pioche and 40° at Winnemucca; Southern Plateau, 30° at Fort Grant to 41° at La Mesilla, 42° at Fort Verde and Florence and 46° at Prescott; North Pacific Coast region, 17° at Portland to 21° at Olympia; Middle Pacific Coast region, 13° at San Francisco to 23° at Sacramento and 29° at Red Bluff; South Pacific Coast region, 28° at San Diego to 31° at Visalia and Los Angeles, 32° Yuma and 41° at Campo.

Table of maximum and minimum temperatures for February, 1882.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Montgomery	80	32	Auburn		28
Arizona	Tucson	74		Maricopa	92	
Do	Prescott		5			
Arkansas	Little Rock	77	28	Mount Ida	76	16
California	Los Angeles	77		Fort Yuma	78	
Do	Campo		17	Fort Bidwell		—12
Colorado	West Las Animas	68	4	Fort Lyon	69	
Do	Pike's Peak		—17	Fort Garland		—18
Connecticut	New London	55		Southington	52	5
Do	New Haven		7			
Dakota	Fort Sully	67		Fort Randall and Olivet.	70	
Do	Fort Stevenson		—35			
Delaware	Delaware Breakwater.	61	24			
District of Columbia	Washington	62	20			
Florida	Key West	85		Fort Barrancas		26
Do	Pensacola		37			
Georgia	Augusta	78	31	Quitman and Thomasville.	80	
Do	Savannah	78				
Do	Atlanta		31			
Idaho	Fort Lapwai	55				
Do	Eagle Rock		29			
Illinois	Springfield	72		Geneseo	76	
Do	Champaign			Elmira		2
Do	Chicago		11	Riley		2.5
Indiana	Indianapolis	65	15	Logansport	68	
Do				Wabash		12
Indian Territory	Fort Supply	75	12			
Iowa	Keokuk	69		Cedar Rapids	72	
Do	Des Moines		1	Cresco		—12
Kansas	Dodge City	69	7	Clay Centre and Fort Scott.	76	
Do	Leavenworth	69				
Do				Fort Wallace		— 5
Kentucky	Louisville	67	20	Bowling Green	68	20
Louisiana	New Orleans	79				
Do	Shreveport		33			
Maine	Eastport	44	— 5	Cornish and Orono	52	
Do				Dexter		— 8
Maryland	Baltimore	59	23	Federalsburgh	64	
Do				Deer Park		9
Massachusetts	Boston	60		Westborough		—10
Do	Springfield		3			
Michigan	Detroit	58		Niles	68	
Do	Alpena and Marquette.		2	Fort Brady		—11
Minnesota	Saint Paul	57		Fort Snelling	58	
Do	Saint Vincent		—35			
Mississippi	Vicksburgh	80	32	Fayette	78	28
Missouri	Saint Louis	73		Protem	75	
Do	Springfield		13	Sedalia		8
Montana	Fort Benton	62				
Do	Terry's Landing		—37			
Nebraska	North Platte	68	— 4	Genoa		— 7
Nevada	Pioche	52	6	Golconda	62	
Do	Winnemucca	51	—17	Halleck		—40
New Hampshire	Mount Washington	35	—21	Contoocookville	53	— 2
Do				Grafton		— 6
New Jersey	Sandy Hook	59		South Orange	62	
Do	Barnegat		18	Somerville		8
New Mexico	La Mesilla	72		Fort Union		0
Do	Santa Fé		11			
New York	New York City	62		Johnstown		—10.5
Do	Albany		7			
North Carolina	Wilmington	77		Lenoir		18
Do	Smithville		24			
Ohio	Cincinnati	64		Westerville		8
Do	Cleveland		17			
Oregon	Umatilla	56	4	Fort Klamath		—25
Pennsylvania	Pittsburgh	60		Dyberry		— 2
Do	Philadelphia		18			
Rhode Island	Newport	53	10	Fort Adams	53	8
South Carolina	Charleston	78	32	Columbia	78	28

Table of maximum and minimum temperatures for February, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Tennessee	Memphis	76				
Do	Knoxville and Nashville.		25			
Texas	Rio Grande City	92				
Do	Fort Elliott		13			
Utah	Salt Lake City	50	4	Kelton	62	—23
Vermont	Burlington	51	— 6	Charlotte	54	
Do				Lunenburg		—15
Virginia	Cape Henry	74		Wytheville		12
Do	Fort Myer		19			
Washington Territory	Almota	54				
Do	Spokane Falls		—14			
West Virginia	Margantown	70	21	Helvetia		12
Wisconsin	La Crosse	65	3	Neillsville		— 8
Wyoming	Cheyenne	55	4	Fort Washakie	56	—28

Frosts.—In the various districts they were reported on the following dates: New England, 1st to 12th, 14th to 28th; Middle Atlantic States, 1st to 12th, 14th to 20th, 22d to 28th; South Atlantic States, 1st to 3d, 5th to 7th, 22d to 26th; East Gulf States, 1st, 2d, 5th, 6th, 7th, 10th, 22d, 23d, 24th; West Gulf States, 1st, 2d, 4th, 5th, 6th, 9th, 21st, 22d, 23d; Rio Grande Valley, 1st, 4th, 5th, 21st, 22d; Ohio Valley and Tennessee, 1st to 11th, 14th to 18th, 21st to 28th; Lower Lake region, 1st to 12th, 14th to 28th; Upper Lake region, 1st to 28th; Extreme Northwest, 1st to 28th; Upper Mississippi Valley, 1st to 28th; Missouri Valley, 1st to 15th, 21st to 26th; Northern Slope, 1st to 28th; Middle Slope, 1st to 9th, 12th, 14th to 17th, 19th, 21st to 27th; Southern Slope, 9th, 20th to 23d; Southern Plateau, 1st to 28th; Middle Plateau, 1st to 5th, 7th, 8th, 12th, 15th, 17th to 25th, 28th; Northern Plateau, 1st to 7th, 9th to 13th, 15th to 23d; North Pacific Coast region, 1st, 2d, 3d, 6th, 7th, 10th, 11th, 13th, 16th to 24th; Middle Pacific Coast region, 2d, 3d, 4th, 7th, 8th, 10th, 11th, 13th, 14th, 15th, 17th to 23d; Southern Pacific Coast region, 2d to 5th, 7th, 8th, 9th, 12th to 15th, 18th to 25th, 28th.

Ice.—Regarding its formation in the northern sections, this subject is considered elsewhere in the Review under the head of Ice in rivers and harbors. The following are exceptional cases of its formation in the southern sections of the country: Princeton, Cal., 19th, ¾ inch thick; Fayette, Miss., 1st; Stateburgh, S. C., 25th; Ashwood, Tenn., 22d to 25th; Charleston, S. C., 25th, one inch thick in some parts of the city; New River Inlet, N. C., 1st; Denison, Tex., 21st and 22d, on shallow pools; Little Rock, 21st; Memphis, 21st, 22d; Fort Supply, Ind. T., 19th; 21st, ¾ inch thick on river; Fort Elliott, Tex., 20th.

Table of comparative minimum temperatures for the month of February.

State or Territory.	Minimum for February, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°			°		*Years.*
Alabama	Montgomery	32	Montgomery	22	1875	Huntsville	—7	'32 & '36	9
Arizona	Prescott	5	Prescott	—11	1880	Fort Canby	—12	1855	12
Arkansas	Little Rock	28	Little Rock	22	1881	Fort Smith	—4	1840	21
California	Campo	17	Campo	16	1877	Fort Bidwell	—18	1868	19
Colorado	Pike's Peak	—17	Pike's Peak	—37	1875	Fort Garland	—23		22
Do	West Las Animas	4	Denver	—20	1881				
Connecticut	New Haven	7	New Haven	—4	1881	Colebrook	—28	1861	9
Dakota	Fort Stevenson	—35	Pembina	—48	1876	Fort Abercrombie	—40	'61 & '69	15
Delaware	Delaware Breakwater	24	Delaware Breakwater	7	1881	Fort Delaware	0	1866?	44
District of Columbia	Washington	20	Washington	—1.5	1875	Washington	—5		49
Florida	Pensacola	37	Saint Marks	28	1875	Fort Barrancas	11	1852?	52
Georgia	Augusta and Atlanta	31	Atlanta	21	1881	Augusta Arsenal	—2	1835	48
Idaho	Eagle Rock	—29	Eagle Rock	—19	1881	Fort Hall	—11	1873?	3
Illinois	Champaign and Chicago	11	Chicago	—13	1875	Winnebago	—26	1864	11
Do						Fort Armstrong	—24	'30 & '35	9
Indiana	Indianapolis	15	Indianapolis	—8	1875	Spiceland	—21	1866	7
Indian Territory	Fort Supply	12	Fort Supply	—8	1881	Fort Gibson	—12	1857?	46
Iowa	Des Moines	1	Dubuque	—31	1875	Guttenburg	—37	1868	4
Kansas	Dodge City	7	Dodge City	—10	1881	Fort Leavenworth	—26	1834?	43
Kentucky	Louisville	20	Louisville	0	1875	Newport Barracks	—20		27
Louisiana	Shreveport	33	Shreveport	22	'75 & '81	Fort Jessup	7	'23 & '38	23
Do						Baton Rouge	10	1852?	52
Maine	Eastport	—5	Eastport	—20	1876	Brunswick	—28	1850?	52
Maryland	Baltimore	23	Baltimore	4	'75 & '81	Fort McHenry	—4		43
Massachusetts	Springfield	3	Boston	—6	1876	Lunenburgh	—26	1855	24
Do			Springfield	—6	1880	Williamstown	—26	1835?	55
Michigan	Marquette	2	Alpena	—27	1881	Ontonagon	—37	1861	11
Do			Marquette	—27	1876	Fort Brady	—47	1873	51
Minnesota	Saint Vincent	—35	Breckenridge	—34	'75 & '79	Fort Ripley	—43	1860	14
Do			Duluth	—34	1875				
Mississippi	Vicksburgh	32	Vicksburgh	21	1875	Columbus	14		10
Missouri	Springfield	13	Saint Louis	—3	1875	Saint Louis	—25	1835	37
Do						Jefferson Barracks	—18	1835	35
Montana	Terry's Landing	—37	Fort Custer	—29	1881	Fort Ellis	—53	1872	6
Nebraska	North Platte	—4	North Platte	—23	1881	Fort McPherson	—24	1874	8
Do						Fort Kearney	—22	1852?	19
Nevada	Winnemucca	—17	Pioche	—5	1879	Fort Ruby	—19	1864?	5
Do			Winnemucca	—5	1880				

Table of comparative minimum temperatures for the month of February—Continued.

State or Territory.	Minimum for February, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°			°		*Years.*
New Hampshire	Mount Washington	—21	Mount Washington	—42	1876	Stratford	—37	1861	11
Do						Dartmouth College	—33	1848?	18
New Jersey	Barnegat	—18	Atlantic City	— 5	1875	Newark	— 7	1861	10
Do			Squan Beach	— 5	1875				
New Mexico	Santa Fé	11	Santa Fé	— 3	'79 & '80	Fort Union	— 7		23
New York	Albany	7	Albany	—18	1875	Sackett's Harbor	—46	1861	8
Do						Belleville	—34	1835	15
North Carolina	Smithville	24	Kittyhawk	11	1881	Fort Johnson	3	1835	54
Ohio	Cleveland	17	Toledo	—12	1875	Hillsborough	—22	1838	35
Do						Marietta	—18	1852?	53
Oregon	Umatilla	4	Umatilla	0	1881	Camp Harney	—16	1868	6
Pennsylvania	Philadelphia	18	Erie	—16	1875	Lewisburgh	—23	'65 & '67	6
Do						Philadelphia	— 2	1866	118
Rhode Island	Newport	10	Newport	— 2	1881	Providence	—16	1866	35
South Carolina	Charleston	32	Charleston	26	1881	Fort Moultrie	6	1835	38
Tennessee	Nashville	25	Knoxville	8	1875	Glenwood Cottage	— 4	1864?	11
Texas	Fort Elliott	13	Fort Elliott	— 1	1881	Fort McKavett	8	1873?	22
Utah	Salt Lake City	4	Salt Lake City	8	1880	Fort Crittenden	— 6		3
Vermont	Burlington	— 6	Burlington	—18	1881	Randolph	—31	1868	5
Virginia	Fort Myer	19	Fort Whipple	1	1881	Alexandria	3	1855	11
Washington Territory	Spokane Falls	—14	Spokane Falls	— 7	1881	Fort Colville	—20	1862	14
West Virginia	Morgantown	21	Morgantown	—10	1875				
Wisconsin	La Crosse	3	La Crosse	—34	1875	Fort Howard	—38	1823	30
Do						Superior City	—38	1863	8
Wyoming	Fort Washakie	—26	Cheyenne	—12	1881	Fort Fetterman	—40	1873	6
Do						Fort Laramie	—35	1864?	25

Low Temperatures.—Winnemucca, Nev., 18th, minimum temperature —17°, the lowest ever experienced at this place. The following notable instances of extremely low temperatures were received too late to be published in the January Review: Parker's Station, Burnt River, Oreg., January 29th, minimum temperature —26°; lowest for many years. Canyon City, Oreg., January 29th, minimum temperature —4°.

PRECIPITATION.

The general distribution of rainfall over the United States and Canada for the month of February, 1882, is exhibited upon Chart No. III from the reports of over 500 stations. From the table in the left-hand corner of the chart is obtained a monthly average for each of the various districts, determined from the records of Signal Service stations, covering a period of several years, to which is subjoined a comparison of the present month with such averages. Upon comparison with the chart the tabulated averages show three areas of deficiency, and one large and irregular area of excess. The latter extends southwestward from the Canadian maritime provinces to central Texas, and thence directly west to the Pacific coast, the departures ranging from 0.25 inch in the South Pacific Coast region to 3.16 inches in Tennessee, and 3.74 inches in the Ohio Valley. Within the central portion of this large area rains were continuous and excessive during the month, resulting in heavy freshets and an enormous destruction of property, the details of which will appear elsewhere in the Review under the head of *Floods.* Of the areas of deficiency, one embraces the South Atlantic States and Florida Peninsula, departures ranging from 0.57 inch in the former to 2.09 inches in the latter. The second area is found in the Rio Grande Valley, departure 0.21 inch. The third comprises the Extreme Northwest, Missouri Valley, Middle Slope, Middle Plateau, Middle Pacific Coast region, and the remaining districts to the north and west, departures ranging from 0.19 inch in the Extreme Northwest to 1.98 inches in the Middle Pacific Coast region. As a means of interesting comparison, the following maximum departures from the normal are given for each year since 1873, together with the corresponding districts: 1874, very large excess, South Atlantic States and excess, Ohio Valley, and Tennessee; 1875, —2.08 inches Pacific Coast regions and +2.00 inches Western Gulf States; 1876, +2.30 inches Upper Lake region and +1.75 inches Middle Atlantic States; 1877, —2.90 inches Ohio Valley and Tennessee, —2.50 inches Eastern Gulf States and —2.35 inches Lower Lake region; 1878, +6.12 inches California coast, +5.27 inches Portland, Oreg., and —2.18 inches Tennessee; 1879, Portland, Oreg., +5.62 inches, —1.60 inches Western Gulf States, and 1.30 inches Middle States; 1880, +4.54 inches Tennessee, +2.47 inches Saint Lawrence Valley, and —2.51 inches Portland, Oreg.; 1881, +4.43 inches North Pacific Coast region, +3.09 inches Upper Lake Region, and +2.83 inches Eastern Gulf States and Lower Missouri Valley.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from regular Signal Service stations are shown in the table of comparative monthly rainfalls, as published in the lower left-hand corner of Chart No. III. The following items of importance are reported by voluntary observers: *Illinois:* Riley, total precipitation for month 2.15 inches, or 0.71 inch more than the average of the past nineteen years. Larger monthly precipitations occurred in 1861, 1869, 1876, and 1881. Total precipitation for winter of 1881–2 was 6.41 inches, or 1.21 inches more than the average of the past eighteen years. Only the winters of 1866–7, 1873–4, 1875–6, 1879–80, and 1880–1 had larger precipitations. *Indiana:* Vevay, total precipitation for the month 6.70 inches, or 3.77 inches above the average of the past seventeen years. *Iowa:* Clinton, monthly rainfall below the average. *Kansas:* Manhattan, monthly precipitation 0.42 inch, or 0.53 inch below the average of the past twenty-two years. Wellington, monthly precipitation 1.18 inches, or 0.63 inch above the average of the past three years. Lawrence, monthly precipitation 1.66 inches, or 0.43 inch above the February average of the past fourteen years; during that period the largest monthly precipitation, 4.60 inches, occurred in 1881; the smallest, 0.03 inch, occurred in 1870. Yates Center, monthly precipitation 2.89 inches, or 0.74 inch above the average of past two years. *Maine:* Gardiner, monthly precipitation 4.96 inches, or 1.67 inches above the average of the past forty-six years. *Maryland:* Fallston, monthly precipitation 4.79 inches, or about 1.50 inches above the average of the past eleven years. *Missouri:* Saint Louis, Missouri Weather Service reports: monthly precipitation 7.34 inches, which has been exceeded only once since 1839, viz.: in 1854, when the amount was 7.74 inches. *New Hampshire:* Contoocookville, monthly snowfall, 37 inches, which is larger than for any winter month during the past twelve years, with the exception of December, 1876, when 42 inches fell. *New York:* North Volney, monthly precipitation 2.70 inches, or 0.02 inch above the average of the past nine years; during that period the largest monthly precipitation, 4.70 inches, occurred in 1876, and the smallest, 0.30 inch, occurred in 1877: The total precipitation for winter of 1881–2 was 11.20 inches; average for nine previous winters 9.12

inches; largest, 13.95 inches, occurred in 1879; smallest, 5.95 inches, occurred in 1877. Palermo, monthly precipitation 2.50 inches, or 0.30 inch below the average of February for the past twenty-nine years; largest during that period, 7.20 inches, occurred in 1866; smallest, 0.10 inch, occurred in 1877. *Ohio:* Cleveland, monthly precipitation 3.14 inches, or 0.88 inch above the average of the past twenty-seven years; during that period the largest monthly precipitation, 4.90 inches, occurred in 1876, and the smallest, 0.25 inch, occurred in 1877. *Texas:* Clarksville, monthly rainfall greater than the average of the corresponding month for past twelve years. *Virginia:* Wytheville, monthly precipitation 5.09 inches, or 1.60 inches above the average of past eighteen years. *West Virginia:* Helvetia, monthly precipitation 6.95 inches, or an excess of 3.77 inches above the average of past six years.

Special heavy rains.—2d and 3d, New Ulm, Tex., 3.00 inches; Fort Barrancas, Fla., 3.92. 3d, Vicksburgh, 2.62; Shreveport, 2.97. 4th, Kittyhawk, N. C., 2.59; Barnegat, N. J., 3.50. 7th, Protem, Mo., 1.44 in seven hours. 7th and 8th, Mount Ida, Ark., 4.75. 8th, Little Rock, 3.33; Montgomery, 3.01; Auburn, Ala., 3.56 in fourteen hours; Decatur, Tex., 2.73. 9th, Mayport, Fla., 1.00 in forty-five minutes. 16th, Protem, Mo., 2.00, from daylight to 9 a. m. 18th and 19th, College Hill, Ohio, 3.00. 19th, Saint Louis, 3.96. 19th and 20th, Swanwick, Ill., 3.60; New Harmony, Ind., 4.30; Springfield, Ill., 2.69; Jefferson Barracks, Mo., 5.12. 20th, Indianapolis, 3.02; Louisville, 2.97; Springfield, Ill., 3.28; Bethel, Ohio, 2.50; Fort Scott, Kans., 2.75 in twenty-three hours; Protem, Mo., 1.49 in five hours; Saint Louis, 2.75. 27th and 28th, Highlands, N. C., 4.00; Eola, Oreg., 3.30. 28th, Little Rock, 2.57; Atlanta, 2.78; Auburn, Ala., 2.33 in nine hours; Protem, Mo., 1.34 in three hours. On the 19th, 20th, and 21st, Saint Meinrad, Ind., 4.50; Curryville, Mo., 8.07.

Largest monthly rainfalls, including melted snow.—Fort Stevens, Oreg., 13.27 inches; Little Rock, Ark., 12.74; Auburn, Ala., 11.31; Highlands, N. C., 11.00; New Ulm, Tex., 10.94; Mount Ida, Ark., 10.80; Portland, Oreg., 10.49; Fort Canby, Wash., 10.48; Fort Gaston, Cal., 10.46; Atlanta, Ga., 10.29; Memphis, 9.92; New Shoreham, R. I., 9.73; Louisville, 9.69; Olympia, Wash., 9.60; College Hill, Ohio, 9.50; Montgomery, Ala., 9.27; Saint Meinrad, Ind., 9.20; Fort Barrancas, Fla., 9.16; Laconia, Ind., 9.13; Eola, Oreg., 9.06; Protem, Mo., 8.98; Saint Louis, 8.94; Barnegat, N. J., 8.91; Shreveport, 8.71; Nashville, 8.58; New Harmony, Ind., 8.56; Clarksville, Tex., 8.25; Anna, Ill., 8.17; Chamois, Mo., 8.08; Charleston, Ill., and Saint Charles, Mo., 8.01; Rolla, Mo., 8.00; Austin, Tenn., 7.95; Springfield, Ill., 7.92; Forsyth, Ga., 7.90; Wellsborough, Pa., 7.86; White Plains, N. Y., 7.80; Princeton, Mass., 7.78; Murfreesborough, Tenn., 7.62; Murphy, N. C., 7.40; Westborough, Mass., 7.32; Ashwood, Tenn., 7.30; San Gorgonio, Cal., and Springfield, Mo., 7.29; Indianapolis, 7.28; Chattanooga, Tenn., 7.24; Swanwick, Ill., 7.17; Vicksburgh, 7.15; Cincinnati, 7.04; Bethel, Ohio, 7.00; Jefferson Barracks, Mo., 6.96; Helvetia, W. Va., 6.95; Vevay, Ind., 6.70; New Corydon, Ind., 6.68; Mascoutah, Ill., 6.54; Spiceland, Ind., 6.53; Big Creek and Centreville, Mo., 6.46; Charlottetown, P. E. Island, 6.37; Jacksonburgh, Ohio, 6.25; Dayton, Wash., 6.16; Northport, Mich., 6.15; Bowling Green, Ky., 6.11; Knoxville, Tenn., 6.10; South Lee, Mass., 6.00.

Smallest monthly rainfalls, including melted snow.—Browns, Hot Springs, Reno, and Tecomo, Nev.; Indio and Mammoth Tank, Cal.; Casa Grande, Maricopa, and Texas Hill, Ariz., none; Fort Meade, Dak., and Yuma, Ariz., 0.01 inch; Duluth, Minn.; Fort Custer, Mont.; Saint Augustine, Fla., and West Las Animas, Col., 0.02; Smithville, Dak., 0.03; Cheyenne, Wyo., and Wadsworth, Nev., 0.05; Santa Fé, N. Mex., 0.06; Fort Sully and Yankton, Dak., 0.09; Forts Lincoln and Yates, Dak., and Camp Near Presido, Tex., 0.10; Rio Grande City, Tex., 0.11; Fort Washakie, Wyo., and Terry's Landing, Mont., 0.12; North Platte, Nebr., 0.13; Foley, Mont., 0.14; Fort Elliott, Tex., 0.16; Fort Bridger, Wyo., and Fort Keogh, Mont., 0.18; Rapid City, Dak., 0.19; Denver, Fort McDermitt, Nev., and Punta Rassa, Fla., 0.20; Deadwood, Dak., 0.21; Dodge City, Kans., and Fort Garland, Colo., 0.22; Fort Shaw, Mont., 0.23; Fort Assinniboine, Mont., 0.24; Fremont and Inavale, Nebr., and Huron, Dak., 0.25; Fort Snelling, Minn., 0.28; Fort Buford, Dak., 0.29; Bismarck and Fort Totten, Dak., 0.30; Lordsburgh, N. Mex., and Superior City, Nebr., 0.35; Pike's Peak, 0.36; Helena, Mont., and Pioche, Nev., 0.37; Fort Benton, Mont., 0.38; Avan, Nebr., and Key West, Fla., 0.40; Manhattan, Kans., and Salt Lake City, 0.42; Fort Hale, Dak., and White Water, Cal., 0.48; Elko and Toano, Nev.; New Chicago, Mont., Stockham, Pawnee, and Weeping Water, Nebr., and Tracy, Cal., 0.50.

Rainy days.—The number varied in New England from 12 to 21; Middle Atlantic States, 10 to 18; South Atlantic States, 4 to 13; Florida Peninsula, 3 to 10; East Gulf States, 11 to 14; West Gulf States, 7 to 16; Rio Grande Valley, 3 to 10; Ohio Valley and Tennessee, 10 to 17; Lower Lake region, 12 to 19; Upper Lake region, 9 to 20; Extreme Northwest, 5 to 11; Upper Mississippi Valley, 5 to 14; Missouri Valley, 4 to 14; Northern Slope, 3 to 8; Middle Slope, 2 to 7; Southern Slope, 3 to 9; Southern Plateau, 6 to

11; Middle Plateau, 7 to 10; Northern Plateau, 6 to 17; North Pacific Coast region, 20 to 24; Middle Pacific coast region, 10 to 12; South Pacific Coast region, 2 to 10.

Cloudy days.—The number varied in New England from 5 to 17; Middle Atlantic States, 6 to 13; South Atlantic States, 5 to 16; Florida Peninsula, 0 to 2; East Gulf States, 6 to 12; West Gulf States, 2 to 15; Rio Grande Valley, 4 to 16; Ohio Valley and Tennessee, 10 to 15; Lower Lake region, 8 to 15; Upper Lake region, 9 to 17; Extreme Northwest, 2 to 9; Upper Mississippi Valley, 4 to 9; Missouri Valley, 4 to 12; Northern Slope, 0 to 7; Middle Slope, 1 to 3; Southern Slope, 5 to 13; Southern Plateau, 2 to 5; Middle Plateau, 5 to 9; Northern Plateau, 10 to 16; North Pacific Coast region, 15 to 17; Middle Pacific Coast region, 6 to 9; South Pacific Coast region, 2 to 6.

Snow.—The dates on which snow fell in the various districts are as follows: New England, 1st to 13th, 17th to 24th, 26th, 27th; Middle Atlantic States, 1st to 6th, 10th, 12th, 19th to 24th; South Atlantic States; 4th, 5th; Tennessee, 4th, 21st; Ohio Valley, 2d, 4th, 5th, 21st to 24th; Lower Lake region, 1st to 5th, 7th, 10th, 17th to 24th; Upper Lake region, 1st to 7th, 9th, 11th, 14th, 16th to 26th; Extreme Northwest, 1st, 3d, 6th, 9th, 12th, 14th to 19th, 22d; Upper Mississippi Valley, 4th, 5th, 17th to 21st; Missouri Valley, 2d, 16th to 21st, 23d, 24th; Northern Slope, 3d, 5th to 8th, 10th to 21st, 23d, 26th to 28th; Middle Slope, 1st, 6th, 7th, 11th, 12th, 17th to 22d, 26th, 27th; Southern Slope, 2d, 3d, 8th, 19th, 20th; Southern Plateau, 1st, 2d, 6th, 7th, 11th, 16th, 18th to 20th, 26th, 27th; Middle Plateau, 1st, 5th to 7th, 9th to 12th, 15th to 17th, 20th, 21st, 26th, 27th; Northern Plateau, 5th, 7th to 9th, 11th, 12th, 13th, 15th, 16th, 17th, 20th to 27th; North Pacific Coast region, 7th to 14th, 16th, 17th, 19th, 20th, 23d, 25th, 26th, 27th; Middle Pacific Coast region, 10th, 11th, 12th, 17th, 18th; South Pacific Coast region, 1st, 6th, 16th to 20th. Particularly heavy or remarkable snowfalls were reported as follows: Contoocookville, N. H., 5th, snow fell to a depth of 20 inches and drifted badly. Newport, R. I., 5th, snow 1 foot deep on a level and drifted to depths of from 2 to 10 feet. Eastport, Me., the storm of the 5th was one of the severest that has visited this section for years. It was accompanied by a heavy, blinding snow, which drifted badly, making travel through the country very difficult for several days. Dubuque, Iowa, 20th and 21st, heavy snow-storm; trains delayed; telegraphic communication interrupted. The Illinois Central Railroad Company ran their snow-plows for the first time this season. La Crosse, 20th, heavy snow-storm set in at 11 a. m. and continued throughout the day; the snow being light, drifted badly, causing delay of trains. 21st, storm ended about 1.30 p. m.; depth of snow about 16 inches. Saint Paul, 21st, snow-storm ended at 12.50 p. m., nearly 2 feet having fallen during 20th and 21st, which is badly drifted. All trains delayed on account of snow blockades, which are reported as being very numerous in the southern part of State. Fort Washakie, Wyo., 20th, heavy snow in mountains; stage abandoned; mails brought in on horseback. Prescott, Ariz., 20th, snow reported to be 6 feet deep on the mountains. Eagle Rock, Idaho, 17th, 7.50 a. m. to 3 p. m., one of the severest snow-storms of the season; trains on the Utah Northern Railroad delayed by blockades. 22d, mails still delayed on account of snow blockades. Salinas City, Cal., 17th, snow fell to a depth of ½ inch, "which is more than has ever before been known to fall at this place." Springfield, Mass., 1st, heaviest storm since 1854; snow 22 inches on the level. Heavy storms in former years occurred as follows: January, 1857, 17 inches; January, 1867, 17 inches; December, 1869, 12 inches; February, 1873, 12½ inches. The great snow-storm of January, 1867, impeded travel to a much greater extent than did the present storm, but the depth of snow was considerably less, the trouble at that time being the drifting by the heavy wind which accompanied the storm. Stockbridge, Mass., 1st, snow 22 inches on the level; heaviest storm for past thirty years. Carbondale, Pa., 4th, heaviest storm for years; snow 36 inches on the level. Lewes, Del., 4th, most violent snow-storm for years; wind attained an estimated velocity of 70 miles per hour. Along both the Middle Atlantic and New England coasts this storm proved to be the heaviest and most destructive for years. Many marine disasters occurred and immense drifts formed, which blockaded all railroad traffic for several days. Port Jervis, N. Y., 1st, snow fell to the depth of 14 inches. Poughkeepsie, N. Y., 1st, snow fell to the depth of 12 inches, and at several points on Long Island to a depth of 16 inches. Boston, 1st, snow 18 inches on the level; one of the heaviest storms for many years. Long Branch, N. J., 4th, most violent snow-storm on these shores for many years. Snow on the ground from 6 inches to 6 feet deep. Drifts in many places rendered travel impossible. All trains delayed. Easton, Pa., 4th, severest storm of the season; railway trains delayed in all directions. Poughkeepsie, N. Y., 4th, storm commenced at 11 a. m., and raged with great fury until 7.30 a. m. of the 5th. Travel of all kinds suspended. Freeport, Long Island, 4th, 10 inches fell during the day; storm still raging. Baltimore, 4th, snow 12 to 14 inches on the level, and in many places drifted from 4 to 6 feet deep. Gloucester, Mass., 1st, snow 18 inches on the level; in many places drifted to a depth of 12 feet and in the main streets from 6 to 8 feet on the north side. Schools closed throughout the city and business generally suspended. Plymouth, Mass., 1st, severest storm for many years. Lebanon, N. H., 22d, 14 inches on the level; heaviest storm of the season. Derby Line, Vt., 22d, 10 to 15 inches on the level. Hanover, N. H., 22d, 12 inches on the level; heaviest fall of the season. Montreal, Can., 22d, streets blockaded with 4 feet of snow; all travel seriously obstructed. Philadelphia, 4th, all traffic much impeded; snow 10 to 15 inches on the level. Reports from various parts of the State show that the storm was most violent in the mountains west of Harrisburgh. At many places the snow fell to a depth of 3 feet. At Williamsport, Sunbury, Reading, and Pottsville, and in the northern part of the State the storm proved to be very violent. South Framingham, Mass., 1st, in Worcester, Middlesex, and Norfolk Counties, highways blockaded; railway trains all delayed. Snow over 20 inches deep on the level. Lowell, Mass., 1st, snow 18 inches on the level. Narrowsburgh, N. Y., 1st, snow 2 feet deep. Monticello, N. Y., 1st, snow 20 inches on the level. Concord, N. H., 11th, snow fell to the depth of 10 inches on the level, making a total of 70 inches since the 1st, "a greater amount than that which has fallen in the whole month of February for the past twenty years." Saint John, N. B., 10th, heavy snow-storm accompanied by violent winds from the northeast. All trains on the Saint John and Maine Railroad blockaded and "tremendous drifts" formed on the Intercolonial Railroad. The car shed of the latter railway company was demolished by the heavy weight of snow; loss estimated at $75,000. Port Jervis, N. Y., 4th, snow 10 to 15 inches on the level and drifted badly; travel seriously impeded. Fredericksburgh, Va., 4th, heavy northeast storm for past fifteen hours; snow 12 inches deep on the level. Trains delayed and all communication on wagon-roads cut off. Petersburgh, Va., 4th, violent snow-storm, extending south to Weldon, N. C., and westward beyond Lynchburgh. At points along the Norfolk and Western Railroad, snow 10 to 15 inches deep. Washington, D. C., 4th, snow fell to the depth of from 12 to 14 inches on the level. Street-car travel seriously obstructed.

Largest monthly snowfalls.—Emigrant Gap, Cal., 94 inches; Summit, Cal., 90; Cisco, Cal., 85; Mount Washington, 54.50; Truckee, Nev., 49.50; Alta, Cal., 49; Princeton, Mass., 44; Westborough, Mass., 42.50; Dayton, Wash., 42.40; Newport, Vt., 39.55; Antrim, N. H., 38.50; Contoocookville, N. H., 37; New Market, N. H., 36.60; Lunenburgh, Vt., 36.50; Boca, Nev., 36; Boston and Grafton, N. H., 34; Woodstock, Vt., 30.75; Eastport, 31.40; Dexter, Me., 30.50; Worcester, Mass., 30.25; Rowe and South Lee, Mass., 30; Marquette, Mich., about 30; Colfax, Cal., and White Plains, N. Y., 29; New Bedford, Mass., about 27; Strafford, Vt., 26; New Shoreham, R. I., 25.30; Rochester, 24.60; Corinne, Utah, and Deer Park, Md., 24; Somerset, Mass., and Fort Myer, Va., 23.30; Saint Paul, 22.60; Ashland, Wis., 22; San Gorgonio, Cal., 21.50; Amherst, Mass., 20; Northfield, Minn., 19.90; Dyberry, Pa., 19.50; Berryvale, Cal., and Helvetia, W. Va., 19; Kelton, Utah, and Port Jervis, N. Y., 18; New London, Conn., about 18; Charlotte, Vt., and Northport, Mich., 17; Escanaba, Mich., and Keene, Cal., 16; Prescott, Ariz., about 16; Fall River, Mass., 15.50; Newport, R. I., and Tehachapi, Cal., 15; Winnemucca, Nev., about 15; Johnstown, N. Y., 14.70; Freehold, N. J., 14.50; Washington, D. C., 14.20; Otega, Nev., 13.75; Catawissa, Pa., 13.40; Palermo, N. Y., and Southington, Conn., 13; Eagle Rock, Idaho, 12.70; Grand Haven, 12.60; South Orange, N. J., 12.25; Atlantic City, 12.10; Accotink and Wytheville, Va., Vineland, N. J., Chambersburgh, Pa., and Carson City, Nev., 12; Port Huron, 11.90; Ogden, Utah, 11.88; Waterburgh, N. Y., and Promontory, Utah, 11.50; Duluth, Minn., 10.80; Lynchburgh, Va., 10.70; Ardenia, N. Y., 10.50; Pagosa Springs, Colo., Halleck, Nev., Flushing, N. Y., Logan, Iowa, Fallston, Md., Princeton, N. J., and Franklin, Wis., 10; New York City, about 10; Wells, Nev., 9.75; Manitowoc, Wis., and West Chester, Pa., 9; Sandusky, 8.80; Terrace, Utah, Moorestown, N. J., and Friendship, N. Y., 8.50; Saint Vincent, Minn., 8.30; Fallsington, Pa., Lincoln, Nebr., Cooperstown, N. Y., Coalville, Utah, and Moorhead, Minn., 8; Fort Missoula, Mont., about 8; Ithaca, N. Y., Somerville, N. J., and New Athens, Ohio, 7.50; Albany, N. Y., and Neillsville, Wis., 7.30; Battle Mountain and Palisade, Nev., Red Bluff, Cal., Williamsport, Pa., and Phillipsburgh, N. J., 7.

Depth of snow on ground at end of month.—*Colorado:* Pike's Peak, about 6 inches. *Connecticut:* Southington, remains of drifts; New London, trace. *Idaho:* Eagle Rock, 3¼ inches. *Iowa:* Ames, 4½ inches. *Maine:* Gardiner, 30 inches, Orono, 10 inches, Eastport, 7 inches. *Massachusetts:* Somerset, trace; Rowe, 29 inches; Amherst, patches in scattering places; Worcester, ground bare in many places; Springfield, 6 inches; Boston, 3 inches; Provincetown, 1 inch. *Michigan:* Northport, ½ inch; Marquette, 12 inches. Escanaba, 0 to ½ inch. *Minnesota:* Northfield, Moorhead, and Saint Paul, trace; Duluth, 4 inches; Saint Vincent, 11 inches. *Montana:* Fort Missoula, 4 inches; Helena, 1 inch. *Nevada:* Pioche, 4 inches. *New Hampshire:* Grafton, 16 inches; Mount Washington, 29 inches; New Market, 13 inches. *New Mexico:* Santa Fe, trace to 3 inches; *New York:* Albany, 2 inches; Cooperstown, 4 inches; Ithaca, Oswego, and Palermo, trace; Johnson, 4 inches. *Pennsylvania:* Catawissa, trace on hills; Dyberry, 6 inches.

Rhode Island: Newport, none in open country, but in sheltered places small quantities remain from the heavy storm that occurred on the 4th and 5th. *Utah:* Salt Lake City, trace. *Vermont:* Burlington and Strafford, 6 inches; Charlotte, 4 to 8 inches; Newport, about 10 inches; Woodstock, 13 inches.

Rain, hail, or snow from a cloudless sky.—Burlington, Vt., 1st, light snow at intervals during the day and night; 2d, 5th, 6th, 13th, 22d, 23d.

Hail.—Mobile, Ala., 28th, 11.30 a. m., lasting one minute; hailstones ⅛ inch in diameter. Mason, Tex., 27th, 7.50 p. m., lasting ten minutes; hailstones as large as pigeon's eggs. Fort Cummings, N. Mex., 27th, light hail. Camp Grant, Ariz., 19th, 10.30 to 11.30 a. m. San Francisco, 11th, 4.55 to 4.57 p. m.; 16th, 4.15 p. m. Los Angeles, Cal., 19th, 3 p. m., hail fell near the foot hills, 5 miles north and in Sierra Madre Mountains, 13 miles north of station. Visalia, Cal., 17th, San Diego, Cal., 1st, 7.22 to 7.25 p. m., hailstones were soft and about the size of peas; 17th, 12.20 p. m., small hail. Point San José, Cal., 15th. Presidio, Cal., 11th, 6.30 a. m. Fort Stevens, Oreg., 5th. Fort Townsend, Wash., 10th. Paterson, N. J., 21st, 5.45 p. m., heavy fall of hail, lasting 10 minutes. Ardenia, N. Y., 21st. Clarksville, Tex., 27th, hail-stones one inch in diameter.

Sleet.—The dates on which sleet fell in the various districts are given as follows: New England, 9th, 10th, 12th, 20th, 21st, 23d; Middle Atlantic States, 4th, 5th, 19th, 21st; Ohio Valley, Cincinnati, 21st; Upper Mississippi Valley, 2d, 17th to 21st; Missouri Valley, 17th to 22d; Southern Slope, 7th, 8th, 19th, 20th; Southern Plateau, La Mesilla, 2d, Fort Verde and Camp Grant, Ariz., 19th; Northern Slope, Fort Washakie, Wyo., 16th; Northern Plateau, Umatilla, Oreg., 22d; North Pacific Coast region, 12th, 16th, 20th; South Pacific Coast region, Visalia, Cal., 17th. Unusually severe sleet-storms have been reported, as follows: Toledo, throughout the night of 20th and during the 21st a storm of rain, sleet, and snow raged with great violence; telegraph polls were prostrated and great damage done to fruit and shade trees. Telegraph lines were down in every direction; all communication cut off. The principal cause of destruction to property was the heavy sleet, which prevailed over an area of country within a radius of 20 miles about Toledo. Damage estimated at over $5,000. Port Huron, Mich., 21st, everything covered with a thick coating of ice. A telegraph pole, supporting 30 wires, was broken down under its weight. Fort Madison, Iowa, storm commenced on 19th and continued during 20th and 21st; rain froze as it fell; ground was covered with a sheet of ice; trees were weighed down with ice, and many limbs broken off. Fort Scott, Kans., 20th to 24th; trees heavily loaded with ice; much damage done. Yates Centre, Kans., 19th and 20th, all exposed objects covered with ice ½ inch in thickness; storm the severest of the kind that has been experienced here for 3 years; sleet covered the ground to a depth of 4 inches. Warrenton, Mo., 20th, trees covered with ice; many evergreens broken down. Dyberry, Pa., 21st, trees on the hills loaded with ice an inch thick; thousands of limbs were broken off and many whole trees fell. All trees looked like weeping willows under the weight of ice. Embarrass, Wis., 20th, ground covered with a sheet of ice. Keokuk, 19th, 30th, rain freezing as it fell, weighing down telegraph wires, trees, etc. Rochester, 20th, very violent storm began in the early evening, accompanied by high wind velocities from the south and southwest. The damage alone to window-glass and sky-lights reached thousands of dollars. Shade trees and telegraph and telephone wires were badly damaged.

Drought.—Deadwood, Dak., 27th, the small precipitation of past two months has caused great complaint as to scarcity of water in this city and in the rural districts.

RELATIVE HUMIDITY.

The percentage of mean relative humidity for the month ranges as follows: New England, from 71 to 81; Middle Atlantic States, 61 to 82; South Atlantic States, 65 to 79; Florida Peninsula, 71 to 73; East Gulf States, 69 to 78; West Gulf States, 64 to 83; Rio Grande Valley, 67 to 81; Ohio Valley and Tennessee, 67 to 72; Lower Lake region, 70 to 79; Upper Lake region, 72 to 82; Extreme Northwest, 61 to 88; Upper Mississippi Valley, 61 to 74; Missouri Valley, 62 to 74; Northern Slope, 54 to 69; Middle Slope, 52 to 60; Southern Slope, 61 to 82; Southern Plateau, 55 to 70; Middle Plateau, 50 to 71; Northern Plateau, 61 to 85; North Pacific Coast region, Olympia, 82.8, Portland, 82.5; Middle Pacific Coast region, 69.75; South Pacific Coast region, 46 to 70. *High stations* report the following percentages not corrected for altitude: Santa Fé, 52.9; Denver, 47.8; Pike's Peak, 73.0; Mount Washington, 81.3.

WINDS.

The prevailing winds during the month of February, 1882, at Signal Service stations are shown on Chart No. II, by arrows which fly with the wind. Along the Middle Atlantic and New England coasts they are northwesterly. In the South Atlantic States, southwesterly. Between the meridians of 80° and 100° W., and from the Gulf northward to Lake Superior, southerly. In the Northern Plateau, Northern and Middle Slopes, southwest to northwest. In the Middle and Southern Plateaux, variable. In the North Pacific Coast region, southerly. In the Middle and Southern Pacific Coast regions, variable.

High winds.—The following are the highest velocities attained on the summit of Mount Washington, with direction at time of occurrence on the respective dates: 120 miles NW., 8th; 116, NW., 13th; 110, NW., 18th; 106, NW., 17th; 90, SW., 28th; 89, NW., 14th; 86, NW., 3d, and W., 19th; 85, NW., 6th and 10th; 84, NW., 16th; 82, NW., 11th; 80, NW., 4th and 15th; 76, NW., 20th; 75, NW., 12th. On all other dates during the month velocities reached or exceeded 50 miles per hour, with the exception of 23d, 24th, and 25th. On summit of Pike's Peak the highest velocities reported are: 60, NW., 3d; 58, SW., 11th; 54, NW., 4th, W., 13th and SW., 18th; 52, SW., 17th, NE., 20th and NW., 28th; 50 W., 5th. Other stations reporting velocities of 50 miles per hour or over are as follows: Fort Shaw, Mont., 62, SW., 14th. Stockton, Tex., 52, NW., 7th. Indianola, 56, SW., 28th; 51, N., 3d. Buffalo, 56, SW., 22d. Rochester, 56, S., 28th. Champaign, Ill., 51, SW., 21st. Eastport, 60, NE., 22d. New Shoreham, R. I., 64, NE, 5th; 60, NE., 4th. Sandy Hook, N. J., 56, NE., 5th; 54, NE., 4th, Barnegat, N. J., 56, N.; 5th, 50, NE., 21st, Cape May, N. J., 60 NW., 4th; 50, NW., 5th. Delaware Breakwater, 56, NE., 4th; 51, NW., 5th; 50 SW., 13th. Cape Henry, Va., 52, NE., 4th. Hatteras, N. C., 64, SW., 21st; 60, SW., 4th. Portsmouth, N. C., 52, SW., 4th and 21st. Umatilla, Oreg., 56, N., 16th. Thatcher's Island, Mass., 58, NE., 5th; 56, E., 22d.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 27,334 miles; Pike's Peak, 14,257; Thatcher's Island, Mass., 12,277; Fort Shaw, Mont., 12,189; Delaware Breakwater, 12,058; Cape May, 12,003; New Shoreham, R. I., 11,417; Portsmouth, N. C., 11,308; Hatteras, N. C., 11,285; Sandyhook, 10,829; Kittyhawk, N. C., 10,353; Eastport, 10,314; Sandusky, 10,029; Barnegat, N. J., 9,848; Indianola, 9,807; Grand Haven, 9,447; Fort Assinniboine, Mont., 9,446; Fort Benton, 9,134; Cape Henry, Va., 8,952; Milwaukee, 8,851; Chincoteague, Va., 8,545; Cheyenne, 8,540; Buffalo, 8,387; Saint Vincent, Minn., 8,335; Boston, 8,095; Macon, N. C., 8,075; Alpena, 8,048; Madison, Wis., 8,008. The smallest are La Mesilla, N. Mex., 1,900; Visalia, 2,239; Florence, Ariz., 2,379; Lynchburgh, Va., 2,600; Silver City, N. Mex., 2,641; Lewiston, Idaho, 2,712; Tucson, Ariz., 2,799; Fort Missoula, Mont., 2,818; Augusta, Ga., 2,890; Salt Lake City, 2,952.

Local storms.—Sitka, Alaska, December 19, 1881. The following report of a most violent storm, although of late date, but from a very distant station, will be found of interest: Heavy gales, ranging from 30 to 50 miles per hour, accompanied by either rain, sleet, or snow, began on the 5th, and continued to date. On the 19th, at 12.30 a. m., the gale increased to a hurricane, with violent gusts of over 70 miles per hour from the east, but no precipitation; temperature from 40° to 43°. At 1.55 a. m., storm showed no abatement in violence, at which time frequent observations were commenced with the following results: 1.55 a. m., barometer 29.06, thermometer 40°, wind E., 46 miles; 2.15 a. m., 28.99, 40°.5, E., 60; 2.36 a. m., 28.99, 40°, E., 64; 2.45 a. m., 28.98, 40°.5, E., 64; 3.07 a. m.. 28.96, 40°.5, E., 62; 3.20 a. m., 28.96, 40°.5, E., 64; 3.30 a. m., 28.95, 40°.5, E., 64; 3.45 a. m., 28.92, 40°.5, E., 66; 4.10 a. m., 28.89, 39°.5, E., 68; 4.30 a. m., 28.89, 39°, E., 56; 5 a. m., 28.82, 40°, E., 44; 5.30 a. m., 28.79, 40°, E., 46; 5.45 a. m., 28.80, 42°.5, SE., 44; 6.40 a. m., 29.04, 41°.5, SE., 41. At 6 a. m. the hurricane was terrible in the extreme, the castle (place of observation) rocked like a cradle and it seemed every moment as if the building would be moved from its foundation. At this juncture there was a loud crash as if the building were rent in twain and it shook more violently than before. Upon ascending to the roof a magnificent but awful scene met the gaze. Sheet lightning flashed in fantastic shapes over the inky black sky, with fearful rapidity. Oceanward the waves were milky white with foam and their roar was heard above that of the storm. All the glass in the tower windows was broken and a portion of the roof blown away. The iron pointers beneath the anemoscope were so twisted as to be rendered useless. About this time the hurricane reached its maximum velocity, 80 miles, continuing for about five minutes. From this time until the following morning the storm gradually abated. 20th, 10 a. m., tide unusually high. In the harbor one steamer and a schooner, both of which were attached to a buoy, which was supposed to be immovable, had drifted over two cable lengths from their original position. Most of the outbuildings along the beach were demolished and floated out to sea in small fragments. The roofs of a large number of houses in the village were seriously damaged, notably that of the castle, the church, and the custom-house. Nearly all of the fences along the beach were prostrated. 11.30 a. m., gale abating; very heavy sea in the harbor. The bell-tower of the Sitka Mission House was thrown down in a perfect wreck. In the Indian village seven of the houses were unroofed and two of them partially destroyed. From various reports concerning the experience of many people in the village, it would appear very probable that a slight shock of earthquake occurred at about 6 a. m. or a short time before the occurrence of the maximum velocity of the hurricane. At 5.45 a. m. a quick, sharp report was heard, as if the building had been rent in twain. A few seconds after this report the large chimney of the guard-house fell down, and in the custom-house a double door and frame-work of solid logs was thrown down, the latter being separated from the side walls on the top and sides more than two inches. At the warehouse the outside entrance door had settled so much that it was only with great difficulty that it could be opened. In the office the floor and central wall were considerably disturbed and the clock which hung against the wall was found to be so far removed from the perpendicular that the pendulum touched the glass door. The direction of movement of shock was from northwest to southeast. The wind directions during the hurricane were from east slowly veering to southeast. The most violent gusts came from the south, veering slowly to the southwest and abating at a point a little west of southwest. The hurricane was one continuous, steady roar from east and southeast, changing its character to gusts of fearful violence from the south, with comparative lulls or calm spells at short intervals. 21st, 7 a. m., gale from the east increasing steadily up to 11.30 a. m., when a sudden gust shook the building with fearful force. The anemometer cups were carried away, but replaced again after a short interval. At noon found it impossible to take reading of the anemometer dial, owing to the violence of the wind and the thick, stinging sleet. The following observations were taken at short intervals: 11.19 a. m., barometer 29.04, thermometer, 36°, wind E., 41 miles, cloudy; 11.30 a. m., 29.03, 36°, E., 40, cloudy; 12.10 p. m., 28.99, 36°.5, E., 43, sleeting; 12.30 p. m., 29.02, 35°, E., 44, heavy snow; 12.45 p. m., 28.99, 36° E., 45, heavy snow; 1.15 p. m., 28.99, 36°, E., 36, light snow; 2 p. m., 28.94, 36°, E., 40, light snow; 2.20 p. m., 28.93, 37°, E., 47, light snow; 2.50 p. m., 28.94, 37°.5, E., 47, light snow; 3.07 p. m., 28.91, 38° E., 44, light snow; 3.20 p. m., 28.90, 38°, E., 44, light snow. This storm, like that of the 19th, began with wind from the east, gradually veering to the south, when the temperature increased and a thaw and rain set in, continuing until midnight. Heavy gales, with rain or snow, continued to the end of the month as follows: 22d, E. 42 miles; 23d, NE. 33; 24th, SE. 40; 25th, SE. 32; 30th, E. 32; 31st, SE. 28. Austin, Tex., 1st, heavy northwest gale, which at times almost reached the violence of a tornado. Fences and trees were blown down and many buildings unroofed. Several houses were entirely demolished. Astoria, Oreg., 9th, violent southerly gale, causing considerable damage to shipping in the harbor and in the city to signs, show-windows, fences, shade trees, and outbuildings. Ilwaco, Oreg., 9th, large warehouse leveled to the ground and several buildings unroofed. "The road across the portage to the weather beach was obstructed with fallen trees to such a degree that it will require a week's work to clear away the *débris*. From shore to shore across the Columbia bar the river was one mass of seething, milky foam, with tremendous sea." Rock Island, Ill., 21st, violent storm of wind and rain; a large portion of the government bridge, a solid stone and iron structure, was blown down; many buildings more or less damaged. Duluth, 21st, very violent wind-storm from NNE., accompanied by driving snow. The sea on Lake Superior ran exceedingly high and all ice in the harbor was broken up; the suspension bridge over the canal badly damaged and rendered impassable. The wind and waves formed a huge breakwater of ice along the exposed shore. Pine Bluffs, Ark., 2d, "violent and desolating wind-storm" passed over a portion of Jefferson County, laying waste cabins, houses, fences, and trees. One person was killed and several injured. Findley, Ohio, 21st, violent wind-storm during early morning. Numerous outbuildings and fences demolished, trees uprooted. Buffalo, 22d, violent southwesterly gale. In some portions of the city it seemed to attain the violence of a tornado. For a space of about three minutes the anemometer registered a velocity of 80 miles per hour. A waterspout was reported to have been seen on Lake Erie between this city and Erie about the time the gale struck Buffalo. Umatilla, Oreg., 16th, heaviest wind-storm experienced at this station for several years. Began at 10 a. m., violence gradually increasing. At 1 p. m. wind velocity 40 miles per hour, soon after reaching the maximum velocity of 56 miles from the north, when the wind suddenly died away. Dense clouds of sand filled the air and no one ventured out of doors; all business suspended. The sand and gravel dashed against windows and the sides of buildings, making a noise similar to that of heavy sleet. Olympia, Wash., 9th, heavy wind-storm from south, accompanied by rain, which began at 11 a. m. Trees, fences, and outbuildings were blown down, signs torn off, and windows broken. Maximum velocity, 42 miles per hour, continued from 2.15 to 2.30 p. m. Delaware Breakwater, 4th, terrific storm prevailed throughout the day, the wind reaching a velocity of 56 miles. The sea washed over the office building, filling the rain-gauge and breaking down the wires of the "Breakwater air-line." Schooner Ellen Rockland, from Portland to Norfolk, ran on the ice-break at 8.30 a. m. Eastport Me., 5th, one of the severest storms that has visited this section for a long time. Two vessels went ashore near West

Quoddy; others lost deck-loads. 22d, very severe storm; about 50 feet of the breakwater to the entrance of Houstin's ship-yard was destroyed, entailing a loss of about $500. Several wharves were slightly damaged. New Haven, 21st, heavy gale; ten canal-boats, loaded with coal, were sunk off Bridgeport, involving a loss of $3,700. Chincoteague, Va., 1st, schooner Dolly Varden wrecked on the beach during gale. New Orleans, 3d, 8.20 p. m., during heavy gale steamers Thomas Dean and Frank Porgoud were driven from their moorings and crushed the New Orleans Pacific Railroad wharves, causing a large amount of damage. A coal fleet of ten barges was sent adrift, five of which were sunk in midstream; loss estimated at $5,000. Mobile, 28th, between 9 a. m. and 1 p. m., severe wind and rain storm; telegraph lines prostrated; considerable damage done. Little Rock, 27th, 7.30 to 10.30 p. m., severe storm, accompanied by thunder and heavy rain; streets were deluged; in some places water reached a depth of 3 feet. The electric display was unusually brilliant. The air was so charged with ozone that the odor was very appreciable, and persons subject to catarrhal affection complained of the irritating effect produced upon the throat and lungs. Several cases of damage from lightning have been reported. Columbus, Ohio, 21st, 6 p. m., severest storm experienced for years. In less than half an hour the wind increased from 10 to 40 miles per hour; buildings, chimneys, fences, etc., were blown down. Hogansville, Ga., 28th, violent wind-storm; several houses destroyed. Spiceland, Ind., 21st, 3 to 3.30 a. m., very high winds, outbuildings blown down and unroofed, trees, &c., blown down. Coalville, Utah, 9th and 16th, heavy wind-storms; large number of trees were blown down and the water in the Sound made very rough.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for February, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 87.16 per cent. The percentages for the four elements are: Weather, 86.44; Direction of the Wind, 84.25; Temperature, 88.15; Barometer, 89.72 per cent. By geographical districts they are: For New England, 90.1; Middle Atlantic States, 92.5; South Atlantic States, 86.9; Eastern Gulf States, 85.8; Western Gulf States, 86.9; Lower Lake region, 88.5; Upper Lake region, 84.5; Tennessee and the Ohio Valley, 87.8; Upper Mississippi Valley, 86.1; Lower Missouri Valley, 81.1; Northern Pacific Coast region, 98.2; Middle Pacific Coast region, 97.1; Southern Pacific Coast region, 93.7. There were 100 omissions to predict (37 being due to the absence of reports from the Pacific Coast) out of 3,444, or 2.90 per cent. Of the 3,344 predictions that have been made, 126, or 3.77 per cent., are considered to have entirely failed; 119, or 3.56 per cent., were one-fourth verified; 351, or 10.50 per cent., were one-half verified; 159, or 4.75 per cent., were three-fourths verified; 2,589, or 77.42 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—139 cautionary signals were displayed during the month of February, 1882, of which 130, or 93.52 per cent. were fully justified by winds of twenty-five miles per hour, or over, at or within a radius of 100 miles of the station. Seventy-six off-shore signals were displayed, of which 60, or 78.94 per cent., were fully justified; 68, or 89.47 per cent., were justified as to direction; 76, or 100.0 per cent., were justified as to velocity. Fifty-two off-shore signals were changed from cautionary. Two Northwest signals were displayed, both of which were fully justified. Two hundred and seventeen signals of all kinds were displayed, of which 192, or 88.48 per cent., were fully justified. The above does not include signals ordered at 69 display stations, where the velocity is only estimated. One hundred and eighty-three winds of 25 miles or more were reported, for which no signals were ordered. Twenty-seven signals were ordered late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand side of Chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of February, 1882. Throughout the Lower Mississippi and Ohio Valleys and along the Red and Arkansas Rivers the heaviest floods for years prevailed during the month. In consequence the stage of water in these rivers has been remarkably high, as shown by the following figures: The Red River reached its highest stage at Shreveport on the 21st, being 31 feet and 5 inches above low-water mark, or 18 inches above the danger line. The Arkansas River reached its highest stage at Little Rock on the 24th, being 21 feet and 8 inches above low-water mark. The Missouri was frozen over during the month at Yankton, but reached its highest stage (a very moderate one) on the 14th at Leavenworth, and on the 27th and 28th at Omaha. The Mississippi remained frozen during the month at Saint Paul and La Crosse, and at a low stage from the 1st to 28th at Dubuque, Davenport, and Keokuk. From Saint Louis to New Orleans reached its highest stage as follows: Saint Louis, 22d, 28 feet and 3 inches above low-water mark, or 21 inches below the danger line; Cairo, 25th and 26th, 51 feet and 10½ inches above low-water mark, or 11 feet and 10½ inches above the danger line; Memphis, 28th, 35 feet and 7 inches above low-water mark, or 19 inches above the danger line; Vicksburgh, 28th, 44 feet and 8 inches above low-water mark, or 3 feet and 8 inches above the danger line. New Orleans, 28th, 15 inches above the danger line. The Ohio River reached its highest stage at the various stations as follows: Pittsburgh, 22d, 21 feet and 1 inch above low-water mark, or 13 inches above the danger line. Cincinnati, 21st, 58 feet and 7 inches above low-water mark, or 8 feet and 7 inches above the danger line. Louisville, 22d, 37 feet and 2 inches above low-water mark, or 38 inches above the danger line. The Cumberland at Nashville reached its highest stage on the 1st, 43 feet and 6 inches above low-water mark, or 18 inches above the danger line. The Tennessee at Chattanooga reached its highest stage on the 1st, 29 feet and 11 inches above low-water mark, or 13 inches below the danger line. The Monongahela remained at a moderate stage throughout the month; highest water at Morgantown on the 9th, and at Pittsburgh on the 22d. No marked change occurred in the Savannah, Willamette, Sacramento, Mobile and Colorado Rivers; those in the extreme Western States reached their highest stage on the 27th.

Ice in rivers and harbors.—Connecticut River: New Haven, 17th, ice broke up. Woodstock, Vt., 28th, river nearly clear of ice. *Delaware River:* Cocheton, 14th, heavy ice gorges, village flooded; several buildings crushed by the ice and carried down the river. *Hudson River:* Newburgh, 14th, river open at this point after having been closed since January 23. Poughkeepsie, 14th, all ice south of Fort Montgomery is on the move. Albany, 14th, ice began moving; 17th, moved down about 19 miles and gorged on a bar at Doves Point, causing the water to back very rapidly, which shortly afterward was running at the rate of seven miles per hour in upon the city, flooding stores and cellars and causing considerable loss to merchants; 18th, river almost free of ice; 19th, river entirely free of ice; 22d, 23d, 24th, floating ice; 25th, frozen over. *Columbia River:* Umatilla, Oreg., 18th, river frozen; 19th, full of floating ice; 26th, clear of ice. Portland, 21st, floating ice. *Palouse River:* Colfax, Wash., 28th, ice broke up during p. m. *Saint Clair River:* Port Huron, 1st, river clear of ice; 2d, 5th, 6th, 8th, 22d, 23d, floating ice. *Grand River:* Grand Haven, 1st, free of ice; 14th, first sailing vessel of season arrived. Lansing, 21st, river closed; 25th, river open. *Rock River:* Rockford, Ill., 23d, frozen over; 26th, ice going out. *Housatonic River:* South Lee, Mass., 17th, ice passed out of the mill-ponds on the river as far up as Pittsfield; no damage done to mills or bridges. *Thunder Bay:* Alpena, 12th, floating ice; 13th, clear of ice; 18th, 19th, partly frozen. *Thunder Bay River:* Alpena, 13th, partly clear of ice; 16th, clear of ice, navigation open; 18th, 19th, partly frozen. *Lake Superior:* Duluth, 22d, lake frozen. *Lake Michigan:* Marquette, 5th, harbor frozen. *Lake Erie:* Cleveland, 6th, ice disappearing; 11th, ice broke up and floated out into the lake. Toledo, 25th, navigation open; 27th, navigation fully open for coasting vessels. *Sandusky Bay:* Sandusky, 11th, ice moved slightly; 12th, ice becoming very soft; 13th, ice entirely disappeared from bay; 23d, bay frozen over; 28th, ice in bay softening. *Maumee River:* Toledo, 13th, ice breaking up; 14th, river fully open, harbor clear of ice. *Niagara River:* Buffalo, 14th, ice moving out of river. *Oswego River:* North Volney, N. Y., 19th, river frozen. *Lake Champlain:* Charlotte, Vt., 4th, partially closed by ice; 15th, much floating ice; 23d, lake closed; 28th, ice moving in middle of lake. *Mississippi River:* Burlington, 10th, ice breaking up; 11th, on the immediate front, and on the Illinois side, the ice completely broke up and passed out; 12th, clear of ice; 22d, large quantity of floating ice; 23d, 24th, 25th, floating ice. Dubuque, 4th, ice becoming unsafe for crossing; 6th, breaking up; 11th, melting rapidly, river nearly clear in front of levee; 12th, ice gorge broke at 10 a. m. near Eagle Point; 11 p. m., river full of ice; 4 p. m., nearly clear, ferry-boat running; 21st, 23d, floating ice, ferry-boat making trips with great difficulty, ice 10 inches thick in sloughs and lakes, ice-cutting resumed; 26th, clear of ice. Keokuk, 22d, river full of floating ice; 27th, free of ice. La Crosse, 13th, ice becoming weak, crossing thereon suspended. Saint Paul, 27th, ice gathering suspended, ice unsafe for crossing. Clinton, Iowa, 12th, clear of ice, navigation open; 22d, 23d, heavy drift ice. Guttenburgh, Iowa, 12th, ice broke up. Muscatine, Iowa, 6th, ice broke up at 1 p. m.; 7th, ferry boats running. *Missouri River:* De Soto, Nebr., 12th, ice broke in river. Omaha, 13th, river open and gorged; 14th, river open; 21st, frozen; 26th, ice breaking up; 27th, river open. Leavenworth, 7th, slush ice in river; 9th, clear of ice; 21st, 22d, 23d, 24th, slush ice in river; 25th, clear of ice.

Floods.—The remarkably heavy rains of the last half of January in the Ohio, Central, and Lower Mississippi Valleys considerably abated during February, but the severity of the floods did not. The rain continued incessant and moderately heavy in these regions, and the destruction of life and property, together with the exceedingly high stage of water, was in many places without precedent. *Alabama:* Montgomery, 2d, great damage throughout the central portion of the State by heavy floods along the Warrior, Bigbee, and Tombigbee Rivers. *Arkansas:* Helena, 17th, river 3½ inches above the highest water ever known and slowly falling. The levee broke at a point about two miles below the city, and again near Westover, submerging the country for a distance of several miles. The embankment of the Iron Mountain and Helena Railroad, leading out from the levee, was washed away for a considerable distance; all telegraph wires along the railroad carried away. The Midland Railroad flooded and entirely useless. All lowlands south of the city submerged, resulting in great distress and loss of property; business entirely suspended. 20th, the principal streets in the central portion of the city flooded, and skiffs and dugouts are the only means of transportation. Water in the city rising steadily, with great destruction of property. Much destitution and distress in the overflowed districts. 24th, river falling at the rate of half an inch every 24 hours. Several miles of the Mobile and Northwestern Railroad washed away. Just below the city 32 plantations, comprising more than 12,000 acres, are all under water. From Memphis to Madison, Ark., a distance of 40 miles to the west, "there is nothing but one wide expanse and waste of water." Little Rock, 23d, river reached the danger line at 9 p. m.; water covered with floating logs, trees, &c. Owing to a break in the levee 30,000 acres of valuable cotton lands were flooded. 24th, river about 24 feet above low-water mark and rising at the rate of one inch per hour. 25th, river commenced falling. Terry's Ferry, 24th, Arkansas River above its banks and the water rising rapidly; large tracts of land overflowed. Adamsburg, 24th, nearly the entire town inundated and the whole of Pastoria county under water; river now running through Flat Bayou. Pine Bluff, 24th, river above its banks and much damage caused to property. Desha's, 24th, "loss of property by flooding very extensive;" water over three feet deep on the north bank. Morianna, 14th, Longville River unusually high, water over the railroad trestle and all trains delayed. Clarendon, 20th, White River overflowed and the water rising steadily. Chicot, 2d, country flooded for miles; heavy breaks in all the levees and water rising with great rapidity. "People moving their household effects on improvised rafts." *Canada:* Warkworth, Ontario, 1st, Mill River overflowed and considerable property damaged. Saint Jacques, Achigan, Quebec, 1st, very heavy rains; water so high that people were compelled to move their household property and stock and abandon their homes; highest water ever experienced here. Montreal, 2d, owing to heavy rains and the rapid melting of the snow in elevated portions of the city, the western section was inundated to a depth of from 4 to 10 feet. "People moved about on improvised rafts;" Grand Trunk Railroad submerged to a depth of from 4 to 6 feet; all travel suspended. *Illinois:* Carlisle, 24th, Okawa River above its banks and considerable property destroyed; two railroad bridges carried away and travel suspended; passengers transferred in boats to the Vandalia, Ohio, and Mississippi trains. Carlinville, 21st, unusually heavy rain for the past forty-eight hours; all trains abandoned, bridges and houses swept away and great damage to farms situated in the lowlands. Vandalia, 21st, Okawa River overflowed and the bottom lands, comprising an area of about five miles square, submerged to a depth of from 6 to 10 feet. A large amount of live stock and lumber swept away. Water higher than at any time since 1875 and still rising; many highway bridges swept away. Bellville, 20th, continued rain for the past forty-eight hours caused all streams to overflow theri banks, flooding fields and doing considerable damage to buildings and fences; tracks of the Louisville and Nashville Railroad across Silver creek bottom submerged and all trains delayed. Alton, 20th, immense damage to city an drailroad property; incessant rain for past forty-eight hours. Macoupin Creek overflowed and all communication with Springfield and Chicago cut off. Wood River overflowed and many farms under water; the river rose from 25 to 30 feet and swept everything before it. In the Wood River bottoms the destruction of property is without parallel in the history of that section of the State. Alton Junction completely inundated; highest water ever known. Springfield, 20th, heavy rains for the past forty-eight hours. All streams rose with unparalleled rapidity; lowlands covered with water from 6 to 12 feet deep. Sangamon River and Lick, Hurricane, and Macoupin Creeks, 45 miles below this point, higher than ever before known. Railroad travel suspended and telegraphic communication cut off; several heavy bridges washed away. Salem, 20th, country flooded for miles about; many bridges in the country washed away; railroad travel suspended and highways impassable. Mount Vernon, 23d, heaviest flood for years; great damage to farm property. Mascoutah, 23d, Silver Creek overflowed; surrounding country flooded and travel generally impeded. Jerseyville, 20th, highest water for the past 40 years; rain continued without cessation for thirty-six hours; bridges, fences, and buildings washed away. Shelbyville, 20th, Okaw River overflowed; water higher than during the great freshet of 1875; bottom lands completely submerged and all crops a total loss. Tuscola, 20th, great portion of the city under water; flood unprecedented; great damage to property; all trains delayed and telegraphic communication cut off. White Hall, 20th. heaviest rain for many years; great damage to farm and city property and considerable loss of stock; railroad-tracks submerged and all travel suspended. Lebanon, 20th, heaviest rain for many years; streams higher than ever before known. Many farms inundated, causing great damage to the wheat crop. Bridges and fences destroyed, incurring a large loss in this respect. Effingham, 20th, rain fell incessantly for past forty-eight hours. Bridges washed away and all railroad travel suspended. Peoria, 20th, very heavy rains during the past two days, but no damage from overflow. River about 10 feet above low-water mark. Cairo, 23d, 12 m., water reached the top of river gauge 51 feet above low-water mark, or 11 feet above the danger-line. 24th, 1 p. m., break occurred in new levee but was checked without damage to property, and on the morning of the 26th a similar break occurred with similar results. To provide against overflow for the past few days has cost the city over $17,000. The water, which owing to great pressure has filtered through the levee, together with the enormous quantity which has fallen during the past few weeks, has about inundated the city. In many places the streets were under water and cellars were flooded. Should this "sipe water," as it is termed, rise eight inches higher every street and walk in the city would be under water. At its present stage the water is the highest ever known in this city and the quantity and general extent is unprecedented. 25th and 26th, water in the Ohio reached 51 feet and 10½ inches above low-water mark, or 11 feet 10½ inches above the danger-line, the highest water ever known here. Charleston, 20th, Cossell, Riles, and Kickapoo Creeks about 10 feet above low-water mark, or 6 inches lower than the flood of 1881; considerable damage to property. 21st, Embarras River higher than ever before known, being 31½ inches higher than the great flood of August 2, 1875; the river rose about 24 feet above low water, or 8 feet above danger line. Damage to the extent of thousands of dollars has been done to bridges, fences, etc., in Coles County. *Indiana:* Madison, 19th, starch factory, saw-mills, ship-yards, cooper shops and cellars on Ohio street, and the railroad depot flooded; river still rising. New Albany, 21st, large amount of damage to private property; 600 houses under water; portions of city along river front flooded for a distance of two miles; all manufacturing establishments closed. Over 100 feet of the trestle-work of the Air Line Railroad was washed away. Heavy washouts on other railroads in vicinity. The flood of 1847 lacked two feet of reaching the high-water mark of 1832, while the flood of 1867 was 4½ feet below that of 1832. The flood of 1869 was six inches below that of 1867, and was very destructive to property along the river as it came on very suddenly. The flood of 1868 was 18 inches below that of the following year. The present flood is still below the high-water mark of 1867. Aurora, 21st, 4 p. m., river higher than during the great flood of 1847; water rose two inches per hour for the past twenty-four hours. In many streets water from 4 to 6 feet deep; people compelled to move to the second story of their dwellings. Lawrenceburgh, 21st, since the night of the 20th all communication with the town was cut off; "almost the entire place was a sea of muddy water;" railroads all washed out, highways submerged, and no steamers could effect a landing. About 3,000 people were rendered homeless. "The water attained a depth of 12 feet in the streets and rushed through them with terrible force. Horses, cattle, and hogs were left to their fate and soon the rushing torrent was covered with their bodies." The destruction of property and the terrible misery accompanying the ravages of this flood are without precedent in the history of this section of the State. Evansville, 21st, river remarkably high for past six weeks; river now above its banks and steadily rising. The Kentucky shore entirely submerged to the tops of the trees; 6 p.m., water 43 feet and 5 inches above low-water mark. 22d, water 44 feet above low-water mark, or 2 feet and 3 inches below the highest water ever known, the great flood of 1867. Orleans, 21st, country for miles about deluged with rain; over 20 squares of northwest portion of city flooded from one to six feet deep. Lost River overflowed, washing away fencing and buildings; hogs and sheep drowned in considerable numbers. Terre Haute, 21st, Wabash River rose 66 inches in past twenty-one hours and still rising at the rate of 2½ inches per hour, with 21 feet in the channel. Railroads badly damaged and all communication suspended. Highest rise of late years occurred in 1875, when there was 27 feet and 8 inches in the channel. Madison, 21st, river rising rapidly, water within two feet of the great flood of 1847. Nearly 1,000 people thrown out of employment; manufactories and residences flooded; great damage to private as well as corporate property. Hagerstown, 20th, heavy rain for the past forty-eight hours. Many streams "bank full" and others spreading over the surrounding country. Vevay, 18th, Ohio River "over its boundaries;" lower part of city inundated, creeks and streams much swollen. 19th, river still rising, people leaving their homes; all the adjacent lands along the river submerged; many frame buildings floated away. 21st, much lumber and many saw-logs have floated away. 22d, river beginning to recede. 23d and 24th, river falling slowly. Laconia, 22d, Ohio River reached its highest point to-day; as compared with former great floods, it is as follows: 34 inches below the flood of 1847; 33 inches above that of 1853; and 1 inch above that of 1867. The bottom lands overflowed, causing immense damage to property. Saint Meinrad, 21st, Anderson Creek higher than ever before known. Rising Sun, 21st, Ohio River higher than at any time since the great flood of 1847. *Indian Territory:* Fort Gibson, 21st, river rising rapidly, and full of drift-wood. *Kentucky:* Covington, 19th, water over the sidewalks near the suspension bridge; river rising rapidly. Carrollton, 19th, principal streets several feet under water; Kentucky River unusually high and rising rapidly; 20th, over 40 dwelling houses, two hotels, two saw-mills, and much other property flooded by high water. About 60 families have been rendered homeless. Most of the highway bridges in the surrounding country have been washed away. Milton, 19th, many of the streets several feet under water; considerable destruction of property. Catlettsburgh, 21st, heavy land slides along the railroad lines and much damage to property in the surrounding country. Louisville, 19th, river rose nearly 2 feet during the past twenty-four hours and still rising, with 29½ feet in the canal and 27½ feet in the chute on the falls. Fourth street cut off by water from all communication with the river; all cellars and first floors in that vicinity flooded. 20th, water rising at the rate of 2 inches per hour. In some portions of the city water 4 to 6 feet deep. Most of the distilleries compelled to close and many manufactories surrounded by water. Highest water since 1867. 22d, river reached its highest point; much damage has been sustained by manufacturers and others living along the river front. 23d, river falling. *Louisiana:* Lake Providence, Carroll County, 2d, county flooded for miles and people compelled to abandon their homes. Heaviest flood for past thirty years. The flood of 1844 was exceeded about 2 feet by that of 1858, the latter about 2 feet by the flood of 1862; the flood of 1862 was exceeded about 18 inches by the flood of 1876 and 1877, and 34 inches by the flood of 1882. Longwood, 2d, levee broken in several places; plantations flooded and most of the negro cabins swept away; country very desolate. Shreveport, 4th, heavy rain for past thirty-six hours. The lakes above the city higher than for the past six years. 20th, the high stage of water in the river seriously threatened plantation property, gin-houses, stock, etc. Breaks in the levees are reported daily and cause great excitement among planters. New Orleans, 11th, a crevasse 300 feet wide and from 2 to 4 feet deep occurred at Kemp Levee, in Tensas Parish. *Mississippi:* Greenville, 25th, levee broke between Easton Landing and Mound City, flooding the surrounding country. Damage to levees amount to over $500,000. At Bolivar the levee is "broken as far as the eye can reach." The levee system is a general wreck; nearly the whole of Bolivar and Washington Counties inundated. *Missouri:* Saint Louis, 20th, remarkably heavy rains; cellars flooded, sewers obstructed, and great damage to embankments and streets. Damage to railroad property in the vicinity of the city unusually large, blockade to railroad travel unprecedented; no trains for forty-eight hours. About 500,000 feet of lumber carried off by the high water. Rise in the river the most rapid known for the past 35 years. So sudden and great was the rise in the Mississippi between Memphis and Vicksburgh that over 270 steamship landings were abandoned in two days. At Forest Park the carp ponds were consolidated into one vast sheet of water. The River des Peres flowing through the park rose above its banks, a condition never before observed by the oldest resident in the neighborhood. Owing to the rapid rise of the water, much freight on the levee, supposed to be out of danger, was submerged before it could be removed. Rosedale, 21st, heaviest flood ever experienced; bottom lands flooded for miles; much damage to farm and city property. Hodimont, 21st, flood almost unprecedented; "streams that have remained quiet the whole year round, excepting for an hour or so after a heavy rain, were converted into broad rivers, rushing with the velocity of a mill-race." Cheltenham, 21st, River des Peres overflowed, flooding all the manufactories of the city; several hundred men thrown out of employment; over 75,000 bricks destroyed. Barret's Station, 21st, Grand Glaze Creek bottom, comprising the whole country between this point and the Meramec River, entirely submerged; hundreds of farms divested of fences and outbuildings. This sudden and extensive rise is without parallel in the history of this section of the State. Saint Charles, 20th, Big Muddy River overflowed and several bridges carried away; considerable destruction of farm property. *New York:* Saratoga, 2d, high water caused great damage to the Adirondack Railroad bridge. Much loss to private property. Thurman, 2d, 400 feet of railroad track covered by a heavy land slide. All streams overflowed. Hadley, 2d, heavy land slide covering 100 feet of railroad track; lands submerged and buildings flooded. *North Carolina:* Wilmington, 11th, heavy freshet along Black River. At Maultsby's Point, heaviest known for years. Over 30 head of cattle drowned and much other property lost. *Ohio:* Cincinnati, 16th, river rising rapidly. 17th, water reached the danger line, or 50 above low-water mark. 18th and 19th, river rising steadily. 20th, houses on the river front partially submerged compelling the occupants to move their property to the second floors; merchants and manufacturers suffered serious interruption to business. 21st, 4 p. m., river 58 feet and 7 inches above low-water mark or 8 feet and 7 inches above the danger line; highest water since 1847 when the river rose 63 feet and 6 inches above low-water mark or 13 feet and 6 inches above the danger line. The highest stage ever known occurred February 17, 1832, when the water reached 64 feet above low-water mark or 14 feet above the danger line. In February, 1815, the water rose over 50 feet above the low-water mark. The following is an hourly record of the rise as noted at the city water-works on the 20th: 6 a. m., 54 feet, 5 inches; 7 a. m., 54 feet, 7 inches; 8 a. m., 54 feet, 8 inches; 9 a. m., 54 feet, 9 inches; 10 a. m., 54 feet, 11 inches; 11 a. m., 55 feet; 12 m., 55 feet, 2 inches; 1 p. m., 55 feet, 3 inches; 2 p. m., 55 feet, 7 inches; 3 p. m., 55 feet, 10 inches; 4 p. m., 56 feet; 5 p. m., 56 feet, 3 inches; 6 p. m., 56 feet, 5 inches; 7 p. m., 56 feet, 7 inches; 8 p. m., 56 feet, 8 inches; 9 p. m., 56 feet, 10 inches; 11 p. m., 57 feet, 2 inches; midnight, 57 feet, 3 inches. 21st, over a half a mile of the trestle-work on the C. and E. N. G. R. R. was washed away. Many large distilleries and other manufactories compelled to suspend operations. Several hundred houses adjacent to the river front had from one to ten feet of water over the first floors. Along Mill Creek many houses were flooded and several buildings were moved from their foundations. 22d, portion of the track of the Cincinnati and Springfield Railroad washed away. Many hogs and cattle drowned. No trains could reach the various depots, and the Plumb street depot was flooded to a depth of five feet. The railroad between this city and Lawrenceburgh was washed away in several places. Great damage caused to the roadbed of the Ohio and Mississippi Railroad; loss to railroad property already amounts to several hundred thousand dollars. Along Mill Creek Valley as far north as Cummingsville the torrent of water swept away houses, stables, fences, and cattle-pens. It is estimated that up to this date about 5,000 persons have been temporarily thrown out of employment. The highest rises since 1859 occurred as follows: 1862, January 24, 52 feet and 3 inches; 1865, March 8, 56 feet and 3 inches; 1869, February 22, 57 feet and 3 inches; 1870, January 19, 55 feet and 3 inches; 1875, August 6, 55 feet and 3 inches; 1877, January 2, 53 feet and 4 inches; 1881, February 18, 53 feet and 1 inch. Zanesville, 19th, Muskingum River very high and rising rapidly. Marysville, 20th, continuous and heavy rains for the past three days and nights. All streams flooded and the valleys in many places covered with water as far as the eye could reach. Batavia Junction, 21st, water highest for several years past. Several railroad lines abandoned. Akron, 21st, Little Cuyahoga River overflowed; trains delayed by heavy washouts. Lancaster, 21st, nearly the whole of Hocking Valley under water; great destruction to farm property. The Hockhocking River overflowed; everything swept away within reach of the rapidly rising water. Country roads impassable. Fremont, 21st, river overflowed and portion of city submerged. Many people compelled to vacate their homes; considerable damage to railroad property. Mount Vernon, 21st, incessant rain for past forty-eight hours; heaviest known for many years. Kokossing River overflowed and several bridges swept away. Germantown, 20th, Twin Creek overflowed; several bridges carried away and many thousand acres under water. Carlisle Station, 20th, heaviest flood for years; all streams overflowed with large loss of private and public property. Dayton, 21st, Miami River reached the high-water mark of the flood of 1881; no damage to property. Logan, 21st, Hocking River higher than for many years; bottom lands submerged. Gambier, 21st, river overflowed; railroad-bridge carried away and much other property damaged. New Comerstown, 21st, incessant rain for the past four days. Tuscarawas River and its tributaries overflowed. Wheat fields submerged and fences swept away. Ironton, 21st, river 43 feet and 8 inches above low-water mark and rapidly rising. Circleville, 21st, Scioto River, unusually high; 5 p. m., river within one foot of the highest point ever reached, and rising at the rate of one inch per hour. Heavy washouts on the railroads. Columbus, 20th, Scioto River rose rapidly during the day. 21st, river reached the highest point known for years; a number of cellars in northwest portion of the city were flooded. In some instances people were compelled to abandon their homes. A large quantity of lumber was washed away. *Pennsylvania:* Easton, 2d, Delaware River 23 feet above low-water mark and rising rapidly. River filled with lumber and broken rafts. The lower floors of mills in South Easton submerged and considerable damage done to the locks on the Lehigh and Delware Canals. Harrisburgh, 21st, Susequehanna eight feet above low-water mark and rising rapidly. Paxton Creek overflowed and much damage in surrounding country. Milton, 21st, heavy rain during past twenty-five hours caused serious washouts on Pennsylvania Railroad and west branch of Pennsylvania Canal; streams considerably swollen; west branch of the Susquehanna River very high. *Tennessee:* Tiptonville, 24th, country flooded some distance from the river; buildings carried away and considerable stock drowned. Memphis, 20th, river remained above the danger line throughout the month; all bottom lands submerged. The extent of territory in surrounding country endangered by the flood has been estimated as containing a population of 30,000. The estimated loss to the cotton crop has been put at 1,000,000 bales. The known loss in some particulars, attending the flood in this region, is 30,000 head of stock and 50 human lives. Railroad travel is "terribly demoralized." *Texas:* Navazota, 10th, Navazota and Brazos Rivers overflowed and hundreds of cattle drowned in the bottom lands. Dallas, 12th, almost incessant rain prevailed throughout eastern and northern Texas during the past week. Entire country flooded. People find it impossible to visit the towns for trade. Trinity

River overflowed and 20 miles of the Texas and Pacific Railroad washed away. Reports from all sections show that the rivers are higher than at any time since the great floods of 1852 and 1866. Large quantities of lumber, cordwood, household utensils, bridge timbers, and farm implements, together with numerous small buildings and the bodies of dead animals, floated down the principal rivers and their tributaries. Heavy washouts reported on all railroad lines, and most of them abandoned regular trains. The Brazos River overflowed to an unprecedented extent. Scores of country bridges washed away. Reports from Fort Worth state that Trinity River still continues to rise. Corsicana, 3d, very heavy rains continued without much interruption during the past three weeks. During the night two serious washouts occurred on the Texas and Saint Louis Railroad. Much other damage in surrounding country. Grapeland, 3d, rain has fallen incessantly for several days past. Water-courses higher than for the past twenty years. *Vermont:* Saint Albans, 2d, Misisqual, Lamville, and Minosski Rivers overflowed, causing much damage to private and corporate property. Railroad travel suspended. Rivers very much swollen throughout the northern portion of the State. *Virginia:* Petersburgh, 14th, in consequence of high water all mills practically ceased operations. Appomattox River higher than for the past five years; water still rising. *West Virginia:* Wheeling, 19th, river 19 feet and 9 inches above low-water mark and rapidly rising. *Washington Territory:* Pomeroy, 28th, snow melting in the mountains caused a sudden rise in streams; portions of the town were flooded.

High tides.—Delaware Breakwater, 21st, unusually high. Chincoteague, Va., 18th, unusually high at 8 a. m.; 21st, very high from 10 to 11 a. m. Indianola, Tex., 18th, 19th, 20th, 24th, 25th. New York, 21st, very high. Plymouth, Mass., 22d, 3 p. m., violent northeast gale, accompanied by the highest tide for many years. The water invaded the streets and cellars and considerable damage was done at the lumber yards. At one of the yards a large bulkhead was torn away and left in ruins. Swampscott, Mass., 23d, remarkably high tide, overflowing some of the streets. On some parts of the beach the waves dashed to the second story windows of neighboring dwellings. Highest tide for many years. Revere Beach, Mass., 21st, tide so high that it damaged the theater building, nearly undermining it.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of Chart No. III. Owing to the presence of ice or the breakage of instruments, observations are wanting as follows: Alpena, 1st to 15th, 21st to 28th; Cleveland, 1st to 10th; Detroit, 1st to 5th, 11th, 12th, 19th to 28th; Duluth, 22d to 28th; Escanaba, throughout the month; Buffalo, 1st to 12th, 23d to 26th; Sandusky, 1st to 12th, 23d to 28th; Chicago, 1st to 5th, 24th; San Francisco, 21st; Marquette, 5th to 28th; Burlington, throughout the month; Milwaukee, throughout the month; Toledo, 1st to 14th; Chincoteague, 21st to 28th; Provincetown, station opened on the 15th; Portland, Me., report too late for publication.

ATMOSPHERIC ELECTRICITY.

Auroras.—The display of the 17th, the most important of the month, was observed from Sydney, N. B., westward to points in the Upper Lake region (Grand Haven being the most westerly) and southward to Atlantic City, N. J., the following stations reporting: Bangor, Me., from 10 p. m. until daybreak of 18th. Cornish, Me., all night, altitude from 10° to 15°. Dexter, Me., very bright, no beams. Orono, Me., during the evening. Gardiner, Me., 8 p. m. Mount Washington, 8 p. m. until a. m. of 18th, a faint light of yellowish white color. Burlington, Vt., from 7 to 11.45 p. m. diffuse light, extending upward 30° from the horizon; no streamers or dark segment. Lunenburgh, Vt., and Amherst, Mass., during the evening. Westborough, Mass., 7 to 9 p. m. Williamstown, Mass., 10 p. m., bright band of light in northern horizon; altitude about 5° and stretching through 30° azimuth. Fall River, Mass., 9 p. m., to midnight. Harvard College, Cambridge, Mass., auroral arch bright and broad; not seen early, but thought to be visible about 7.30 p. m.; distinct, later; some streamers about 10.30 p. m. Springfield, Mass., first seen at 7.25 p. m. as a mere glow in the west; at 10 p. m. it was visible in the north, and until 11.30 p. m., when last observed. Newport, R. I., from 8.30 to 10 p. m., faint, altitude about 10°; azimuth, 45°. New Shoreham, R. I., from 8 to 11.50 p. m. brilliant; it formed an arch about 15° above the northern horizon and 10° in width; well-defined, luminous beams were exhibited, and often bright flashes of light would extend from 30° to 40° above the horizon. Southington, Conn., diffuse light. Toronto, Can., during the evening. Rochester, 9.30 p. m., dim aurora with a dark segment of 5° altitude, no streamers visible. Waterburgh and Ardenia, N. Y., during the evening. Freehold, N. J., 8.45 to 9.30 p. m. low aurora, only a white glow; altitude 10°. Somerville, N. J., during the evening. Moorestown, N. J., low sheet aurora. Readington, N. J., during the evening. Atlantic City, 9 p. m., faint low aurora. Fallsington, Pa., 9 p. m. Mount Forest, Can., during the evening. Alpena, Mich., 10.30 to 11.30 p. m., aurora consisted of diffuse light without streamers. Thornville, Mich., 8.30 p. m., no rays; merely a dull diffused light, 20° above the horizon; when last observed, at 10.30 p. m., it remained unchanged. Grand Haven, Mich., 8.30 to 9.30 p. m., faint aurora in northern sky; had the appearance of morning dawn; altitude 5°, azimuth 20°. La Fayette, Ind., aurora flashing up in the north to a height of 30°, resembling faint sheet lightning. The display of the 8th was reported by the following stations: Eastport, Me., from 9.30 to 11.30 p. m., faint aurora appeared in northern horizon, altitude 15°, color, very faint bluish white. Orono, Me., during the evening. Dexter, Me., bright arch. Gardiner, Me., 9.15 to 11.15 p. m., faint aurora. Burlington, Vt., 7 to 11 p. m., faint aurora; no prominent features. Woodstock, Vt., 9 p. m., faint nebulous light rising 15° or 20° above the horizon. Harvard College, Cambridge, Mass., fine aurora with streamers in the evening; traces visible at 11 p. m. North Volney, N. Y., 9 p. m., brilliant streamers. Ithaca, N. Y., faint auroral light, no striking features. Friendship, N. Y., during the evening. Waterburgh, N. Y., 9 p. m., diffuse light in the north, some faint streamers. Toronto, Can., during the evening. Fort Brady, Mich,, 9 p. m. Alpena, Mich., 8 to 11.25 p. m., consisting of a diffuse light without streamers. Northport, Mich., 8.20 p. m., consisting of arch of 15° altitude, most brilliant in the northeast. New Corydon, Ind., 5 a. m. Saint Vincent, Minn., from 7.30 to 9 p. m., several beams of light extended to a height of from 7° to 10°, but owing to a bank of stratus clouds along the northern horizon, their brilliancy and characteristics were indistinct. Bismarck, Dak., 9 to 11 p. m., appeared as a nebulus light, elevation about 8°. The display of the 5th was reported by the following stations: New Shoreham, R. I., 7.50 to 9 p. m., faint aurora in the form of an arch, about 15° above the northern horizon and 8° in width. Southington, Conn., 8 p. m. Marquette, Mich., 7.15 to 7.35 p. m., faint aurora. Manitowoc, Wis., during the evening. New Corydon, Ind., 6.30 to 7 p. m., bright white segment, altitude 10°, extension 60°. Riley, Ill., 7.30 p. m., arch 4° broad, altitude 12°; disappeared before 9 p. m. Elmira, Ill., from 7 to 8 p. m. Cresco, Iowa, 6.30 to 6.45 p. m., faint aurora; patches of light, forming portions of an arch, and constantly shifting. Saint Paul, Minn., 9 p. m., until after midnight; diffuse light of pale yellow, changing to bright orange and pale green; at 11 p. m., there was a well-defined arch 15° above northern horizon, from which slender luminous columns shot up towards the zenith with a wavy motion from left to right; they resembled merry dancers. The display of the 6th was reported by the following stations: Dexter, Me., during the evening. Newport, Vt., during the evening. Buffalo, 1.45 a. m., became visible during temporary break in the clouds; it was observed for one-half hour; no well-defined arch was formed, it being broken and consisting of numerous bright beams, some extending to an altitude of 30°. Its horizontal limit was from NW. to NE. and was about 8° above the horizon. The whole display had a slight movement from W. to E. Cleveland, Ohio, 11 to 11.30 p. m., diffuse light of straw color; no streamers. Milwaukee, 1 a. m., diffuse light. The following isolated displays were reported: Eastport, Me., 23d, 11 p. m. to midnight, extending from NW. to NE., and to an altitude of 30°. It was so nearly obscured by clouds that no peculiarities were detected. Gardiner, Me., 18th, low diffuse arch; not visible until after 9 p. m. Harvard College, Cambridge, Mass., 11th, 11.30 p. m., faint trace of aurora low down in the north. New York, 28th, 7 p. m., faint aurora, visible until 7.50 p. m., when the sky became obscured by clouds. It appeared as a horizontal light and was characterized by recurring fits of brilliancy; its color was at first a pale red, and later a bright red. It appeared about 20° E. of N., covering 20° azimuth, and extended about 20° above the horizon; its center or crown extended upward about 30°. Catawissa, Pa., 18th. Toronto, Can., 9th. Lansing, Mich., 9th. New Corydon, Ind., 10th, 1 to 3 a. m., strong auroral light. Manitowoc, Wis., 9th, 9.30 p. m., with arch; 13th, 11 p. m., with arch. Embarras, Wis., 12th, 8.30 p. m., faint aurora. Beloit, Wis., 9th. Cresco, Iowa, 10th, midnight, faint light in horizontal lines from NW. to NE., probably an aurora. Clinton, Iowa, 9th, from early evening till 9 p. m.; it presented the beams usually seen, with a wavy motion. Monticello, Iowa, 19th, 10 p. m. Clay Centre, Kans., 22d, 10 p. m. Saint Vincent, Minn., 7th, 8 to 10 p. m., pale diffuse light; 9th, 7 to 10 p. m., brilliant light of greenish color with beams resembling merry dancers; altitude 6° to 15°. Fort Stevenson, Dak., 12th, 8 to 8.45 p. m., 2 arches, parallel to each other. Fort Assinniboine, Mont., 20th, first seen at 4 a. m. and ended at 7 a. m.; observed again in the evening, and remained visible until obscured by clouds at 11 p. m.; at 10 p. m. beautiful streamers in large numbers shot upward to a height of 45°, appearing and disappearing in rapid succession. Both auroras extended from NNW. to ENE., azimuth 45°; altitude 25°. Fort Benton, Mont., 18th, 9 p. m.; 19th, 9 p. m.

Thunder-storms.—They were reported in the various districts on the following dates: New England, 21st; Middle Atlantic States, 21st, 28th; South Atlantic States, 4th, 8th, 9th, 14th, 18th, 21st, 28th; Florida Peninsula, 9th, 28th; East Gulf States, 3d, 8th, 15th, 27th, 28th; West Gulf States, 2d, 3d, 7th, 8th, 12th, 14th, 15th, 19th, 20th, 24th, 25th to 28th; Rio Grande Valley, 2d, 19th, 27th; Ohio Valley and Tennessee, 8th, 12th, 16th to 21st, 23d, 27th, 28th; Lower Lake region, Hudson, Ohio, 19th; Upper Lake region, Kalamazoo, Mich., 12th, 13th; Upper Mississippi Valley, 12th, 13th, 16th, 20th, 27th, 28th; Missouri Valley, 7th, 12th, 16th to 21st, 24th to 28th; Middle Slope, 7th, 8th, 12th, 15th, 16th, 19th, 20th, 27th, 28th; Southern Plateau, La Mesilla, N. Mex., 2d.

Telegraphic communication interfered with by atmospheric electricity.—Chincoteague, Va., 28th, kept up a continuous rattle for about two hours. Fort Supply, Ind. T., 19th, during a. m. showers of sparks shot across the switch-board. Fort Reno, Ind. T., 19th.

OPTICAL PHENOMENA.

Solar halos have been observed in the various districts on the following dates: New England, 4th, 5th, 9th, 15th, 16th, 17th, 20th, 23d, 25th, 26th; Middle Atlantic States, 1st, 2d, 3d, 7th, 8th, 11th to 14th, 16th, 17th, 25th, 26th; South Atlantic States, 2d, 13th, 25th, 26th; Florida Peninsula, Cedar Keys, 19th; Ohio Valley and Tennessee, 1st, 3d, 4th, 6th to 11th, 13th to 19th, 25th, 26th, 28th; Lower Lake region, 6th to 9th, 11th, 15th, 25th to 28th; Upper Lake region, 1st, 2d, 4th, 6th, 11th, 12th, 17th, 19th, 22d, 24th; Extreme Northwest, 1st, 6th, 16th, 23d; Upper Mississippi Valley, 3d, 4th, 6th, 8th, 10th, 12th, 14th, 15th, 17th, 18th, 19th, 21st, 22d; Missouri Valley, 3d, 4th, 10th to 15th, 24th, 25th, 28th; Northern Slope, Fort Assinniboine, 15th; Middle Slope, 3d, 6th, 10th, 12th, 14th, 24th, 27th; Northern Plateau, Umatilla, Oreg., 3d, and Dayton, Wash., 17th; Middle Pacific Coast region, 1st, 2d, 3d, 9th, 15th, 23d, 24th, 26th; South Pacific Coast region, 5th, 7th, 27th.

Lunar halos have been observed in the various districts on the following dates: New England, 1st, 2d, 3d, 5th, 20th, 23d, 25th, 26th; Middle Atlantic States, 1st to 7th, 24th, 25th, 26th; South Atlantic States, 7th, 11th, 20th, 25th to 28th; Florida Peninsula, 2d, 3d, 25th, 28th; East Gulf States, 1st, 7th, 24th, 26th; West Gulf States, 1st, 11th, 23d, 26th; Rio Grande Valley, Eagle Pass, 27th; Ohio Valley and Tennessee, 1st to 4th, 6th, 7th; 8th, 11th, 24th to 28th; Lower Lake region, 1st to 7th, 24th to 27th; Upper Lake region, 1st, 3d, 4th, 24th, 25th, 27th, 28th; Extreme Northwest, 1st, 5th, 23d, 24th, 26th, 27th, 28th; Upper Mississippi Valley, 1st, 2d, 3d, 7th, 8th, 9th, 13th, 21st, 24th, 26th, 28th, Missouri Valley, 1st, 2d, 4th, 6th, 8th, 10th, 24th, 25th, 26th, 28th; Northern Slope, 1st, 2d, 22d to 26th, 28th; Middle Slope, 3d, 5th, 24th, 25th, 27th, 28th; Southern Slope, 6th, 26th, 27th; Southern Plateau, 3d, 4th, 5th, 8th to 11th, 23d, 24th, 25th, 27th; Middle Plateau, 5th, 23d to 26th; Northern Plateau, 1st, 22d, 23d, 28th; North Pacific Coast region, Olympia, Wash., 3d, and Roseburgh, Oreg., 2d; Middle Pacific Coast region, 3d, 4th, 5th, 15th, 16th, 20th, 26th; South Pacific Coast region, 3d, 4th, 5th, 23d, 24th.

Mirage.—Indianola, Tex., 4th, 8th, 9th. Huron, Dak., from 7 to 8.30 p. m., "making the plains, which were covered with snow, appear like vast perpendicular walls with horizontal tops."

MISCELLANEOUS PHENOMENA.

Meteors.—Rio Vista, Cal., 20th, 10.25 p. m., very brilliant, making the smallest objects distinctly visible for several seconds; its light was much brighter than that of the full moon. Morrison, Ill., 8th. New Corydon, Ind., 8th. Cedar Rapids, Iowa, 2d. Yates Center, Kans., 3d, 10.15 p. m., moving with a slow, uniform motion towards the S., color pale yellow and as bright as Jupiter, path about 20°, no tail or explosion. Fallston, Md., 10th, 8 p. m., very large and brilliant, path S. to N. The light was sufficiently brilliant to cast distinct shadows. Some persons reported the occurrence of a loud explosion, resembling that of a distant powder-mill; the meteor finally burst into many fragments. Dexter, Me., 6th, bright. Woodstock, Md., 2d; 10th, very brilliant, exploded like a rocket; 23d, 27th. Fall River, Mass., 26th, 6.30 p. m. Rowe, Mass., 14th. Protem, Mo., 11th, 7 p. m., about the size of Jupiter, started near the zenith and shot toward the western horizon; 23d, 7.30 p. m., apparently double the size of Jupiter; when first observed it was a few degrees S. of zenith and pursued a southerly course; before disappearing a portion of it separated from the main body and shot upward; a small and beautiful blaze followed in its track; no report was heard. Vineland, N. J., 15th. Palermo, N. Y., 10th. Waterburgh, N. Y., 3d. Ellsworth, N. C., 10th. Flemington, W. Va., 11th. Des Moines, Iowa, 4th, 4.15 a. m., first appeared near horizon and passed from W. to E.; it resembled a large ball of fire; objects in vicinity were rendered clearly visible; the light lasted about three seconds. A few persons, residing in Boone and Greene Counties, stated that they were awakened by a loud report, as of a ten-pound cannon. The meteor was reported to have been seen in several other counties. Fort Bayard, N. Mex., 6th. Sacramento, Cal., 20th, 10.20 p. m., very brilliant; seen through the clouds, it gave a purple light; no noise or explosion,

Zodiacal light.—New Haven, 14th, 15th, 18th; Nashville, 4th, 5th, 6th, 9th, 10th; 11th, 17th; Saint Vincent, Minn., 4th, 14th; Springfield, Ill., 3d, 5th, 6th, 8th, 14th, Dayton, Wash., 6th, 10th, 17th, 18th; New Corydon, Ind., 5th, 8th, 9th, 10th, 14th

15th; Spiceland, Ind., 14th; Wabash, Ind., 5th, 15th; Clinton, Iowa, 7th, 8th, 9th, 14th, 15th, 16th; Cresco, Iowa, 7th, 8th, 13th; Monticello, Iowa, 1st, 9th, 10th, 13th, 15th; Dana, Iowa, 7th, 8th, 9th, 12th, 13th, 14th, 15th; Cedar Rapids, Iowa, 14th, 15th; Yates Center, Kans., 4th, 5th, 7th, 8th, 9th, 11th, 12th, 13th, 16th; Cornish, Me., 11th, 14th, 18th; Sandy Springs, Md., 8th; Cambridge, Mass., 15th, 24th; Somerset, Mass., 6th, 8th, 10th, 11th, 15th, 17th, 18th; Rowe, Mass., 14th; Northport, Mich., 17th; Northfield, Minn., 8th, 9th, 13th, 14th, 16th; Freehold, N. J., 10th, 18th; Atlantic City, N. J., 6th, 7th, 8th, 10th, 11th, 14th, 15th, 17th, 18th; Waterburgh, N. Y., 6th, 13th, 14th, 15th; Elsworth, N. C., 10th, 11th; Bellefontaine, Ohio, 4th, 5th, 6th, 14th, 16th; Albany, Oreg., 17th, 18th; Dyberry, Pa., 5th, 10th; New Ulm, Tex., 12th; Wytheville, Va., 6th, 10th, 11th.

Migration of birds.—Geese flying southward: Dana, Iowa, 15th; Delaware Breakwater, 2d; Castroville, Tex., 18th; Indianapolis, Ind., 21st; Rapid City, Dak., 12th; Sacramento, Cal., 5th. *Flying northward:* Hector, N. Y., 27th; Bellefontaine, Ohio, 12th; Austin, Tenn., 9th; Elmira, Ill., 12th; Clinton, Iowa, 10th, 12th; Fort Madison, Iowa, 7th, 8th, 23d, 24th; Monticello, Iowa, 11th, 12th; Dana, Iowa, 28th; Independence, Kans., 14th, 18th; Yates Center, Kans., 5th; Protem, Mo., 28th; Clear Creek, Nebr., 3d; Genoa, Nebr., 28th; Delaware Breakwater, 7th, 13th; Erie, Pa., 28th; Cairo, Ill., 16th; Omaha, Nebr., 6th, 27th; Red Bluff, Cal., 8th, 9th. *Ducks flying northward:* Charleston, Ill., 6th, Des Moines, Iowa, 10th, 11th; Genoa, Nebr., 28th; Fort Gibson, 19th; Indianola, Tex., 20th, 23d; Morgantown, W. Va., 18th. *Flying southward:* Charleston, Ill., 21st. *Pigeons flying northward:* Guttenburgh, Iowa, 10th.

Prairie and forest fires.—Fort Gibson, Ind. T., 10th, 11th, 12th; Fort Stevenson, Dak., 5th, 8th, 10th, 11th; Bismarck, Dak., 13th, 14th; Yankton, 5th, 6th, 7th, 8th, 9th, 14th; Huron, Dak., 6th, 7th, 8th, 10th, 15th, 16th; Deadwood, Dak., 28th; Dodge City, 6th; Fort Supply, Ind. T., 5th, 6th, very extensive, 12th; Fort Hall, Dak., 6th; Protem, Mo., 5th; Genoa, Nebr., 3d to 15th; Wellington, Kans., 12th to 16th.

Polar bands.—Punta Rassa, Fla., 5th; Nashville, Tenn., 12th; Fort Stevenson, Dak., 9th, 11th; Florence, Ariz., 6th; Sacramento, Cal., 22d; New Corydon, Ind., 1st to 6th, 8th, 18th, 25th; Yates Center, Kans, 10th, 12th, 13th; Vineland, N. J., 2d, 3d, 11th, 14th, 17th, 18th; Woodstock, Vt., 2d, 8th, 23d; Wytheville, Va., 2d, 17th, 18th.

Earthquakes.—Pagosa Springs, Colo., 11th, 1.30 a. m., heavy shock. San Gorgonio, Cal., 3d, 2.40 a. m., sharp shock, shaking the house and rattling the windows; direction apparently from S. to N., duration about thirty seconds.

Sand storms.—Stockton, Tex., 7th, 27th; Yuma, Ariz., 6th, 17th; Camp Thomas, Ariz., 11th, 14th, 17th; Umatilla, Oreg., 14th, 15th, 16th; Fort Cummings, N. Mex., 27th.

Sunsets.—The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 187 stations show 5,177 observations to have been made, of which 27 were reported doubtful; of the remainder, 5,150, or 84.7 per cent., were followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

Date—Feb., 1882.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.
1, 11 a. m.	1	4	1	6	1	4	4	‡18
2, 9 a. m.	0	0	1	3	0	0	8	15
3, 11 a. m.	1	5	0	0	0	0	4	‡20
6, 10 a. m.	....	....	....	....	....	....	8	‡35
8, 5 p. m.	0	5	0	0	0	0	3	‡35
10, 11 a. m.	1	10	0	0	0	0	4	‡50
11, 11 a. m.	2	10	0	0	1	3	6	‡60
12, 12 m.	0	0	0	5	0	0	6	‡55
14, 12 m.	1	10‡	1	5	1	2	6	‡60
15, 11 a. m.	0	5	0	5	0	5	6	‡60
16, 11 a. m.	0	0	1	5	0	0	5	‡55
17, 11 a. m.	0	0	1	10	0	0	4	‡45
18, 11 a. m.	0	0	0	0	0	0	8	‡30
20, 11 a. m.	1	5	0	5	1	5	4	‡20
23, 11 a. m.	1	5	....	....	....	....	4	‡25
24, 10 a. m.	0	0	1	5	0	0	8	‡20
25, 4 p. m.	1	5	0	5	0	0	4	‡20
26, 4 p. m.	0	0	1	4	0	0	2	‡10
27, 10 a. m.	1	1	0	0	1	1	2	10

‡ Approximated. Faculæ were seen at the time of every observation.

Mr. William Dawson, of Spiceland, Ind., reports: 1st, 4 groups, 25 spots. 3d, 5 groups, 20 spots, one large spot east and one west. 5th, 4 groups, 20 spots; air very poor. 8th, 5 groups, 100 spots; air good. 13th, 6 groups, 36 spots; air very poor. 14th, 6 groups, 60 spots; air very good. 15th, 8 groups, 72 spots; air good. 25th, 4 groups, 14 spots; air good. Mr. David Trowbridge, at Waterburgh, N. Y., reports: 11th, 7 groups, 24 spots; some groups and spots large. 14th, 5 groups, 16 spots; groups same as observed on the 11th; two of the groups of the 11th have disappeared; facula in the west. 15th, 7 groups, 20 spots; one group appeared by rotation and one has divided into two; faculæ in the west. 18th, 3 groups, 5 spots. 24th, 2 groups, 3 spots. 25th, 2 groups, 2 spots; the western group of 24th has gone out and a new one in the east has arisen. 27th, 2 groups, 3 spots; one group has just appeared by rotation. 28th, groups and spots same as on 27th. The following record of observations has been forwarded by Mr. A. S. Bender, Sacramento, Cal.: 7th, 11.30 a. m., 6 groups, 35 spots; 3 of the groups were of 2 spots each, 1 group of 3 spots, and possibly the other groups containing the great number of small spots may be but one. 10th, 12 m., and 11th, 12 m., same as observed on 7th. 13th, 11.30 a. m., 7 groups, 35 spots; some of the spots very small. 14th, 1 p. m., 7 groups, 35 spots; 1 new group, 1 spot; 1 group disappeared. 15th, 1 p. m., 7 groups, 35 spots; light clouds prevented close observation. 16th, 2 p. m., 5 groups, 25 spots, not quite clear. 18th, 12 m., 3 groups, 12 spots; 1 group, 2 spots disappeared by rotation. 19th, 12 m., 3 groups, 8 spots, perhaps more; not quite clear. 21st, 1.30 p. m., 2 groups, 5 spots; 1 group, 1 spot disappeared by rotation. 22d, 12 m., 4 groups, 13 spots; 2 new groups, 2 spots, one of which probably appeared by rotation. 24th, 2 p. m., 3 groups, 10 spots; 1 group, 1 spot disappeared by rotation; not quite clear. 25th, 1 p. m., 1 group, 1 spot; 1 of the new, and a large dim group disappeared. 26th, 2.15 p. m., 1 group, 1 spot. 27th, 11.30 a. m., 3 groups, 5 spots; 1 group, 1 spot reappeared by rotation. One of the spots which appeared on the 22d, and disappeared on the 25th, has now reappeared, and each of the single spots has divided and become two. 28th, 12 m., 1 group, 1 spot; the 2 small groups are probably not gone, but may be hidden by light clouds while permitting the large new spot to be seen. Faculæ visible on all clear days.

Published by order of the Secretary of War:

W. B. HAZEN,

Brig. & Bvt. Maj.-Gen., Chief Signal Officer, U. S. A.

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APPENDIX No. 84.

MONTHLY WEATHER REVIEW, MARCH, 1882.

INTRODUCTION.

Meteorological data received at this office for the month of March have been carefully examined, and a general summary of the several meteorological elements is given below with accompanying charts. The part of this review descriptive of the weather conditions of North America during the month of March, 1882, is based upon observations taken at more than seven hundred stations, so distributed as to furnish trustworthy records of atmospheric phenomena occurring in the United States and British America between the twenty-fifth and fifty-fifth parallels of latitude.

In comparing the weather conditions which are the subject of this Review with those of the corresponding period of previous years the most noticeable features are:

First. The excessive temperature over the mean temperature of March of previous years in all districts east of the Rocky Mountains, and on the North Pacific coast, where the excess in Oregon and Washington Territory ranged as high as 7° above the mean for the month.

Second. The excess of rainfall in the central Mississippi, the Ohio Valley, and Tennessee, where the rainfall was greatly in excess during the previous month, thus causing a continuation of the destructive floods in the lower Mississippi River and its tributaries, where the water has risen in many places to a higher stage than ever before known.

Third. The slight excess of rainfall in southern California, which, when considered in connection with the rainfall of the preceding month, is favorable for the agricultural and grazing interests of that region.

In considering that portion of the Review referring to international meteorology, the most marked features are the exteme high barometer and unusually cold weather that prevailed in the eastern hemisphere during January, 1880. The chart of areas of low barometer for April, 1880, accompanying this Review exhibits the movements of forty-three barometric minima, or a larger number than previously traced on any other chart of this series.

In preparing the Review the following data have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 135 Signal Service stations and 15 Canadian stations, as telegraphed to this office; 190 monthly journals and 170 monthly means from the former, and 15 monthly means from the latter; 218 monthly registers from voluntary observers; 58 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald Weather Service; abstracts of ships' logs, furnished by the publishers of The New York Maritime Register; monthly reports from the local weather services of Iowa, Nebraska, and Missouri, and of the Central Pacific Railway Company; trustworthy newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure over the United States and Canada is shown by the isobarometric lines (in black) upon Chart II. The area of lowest mean pressure occupies the regions northeast of New England and the area of high pressure extends over the southern States and the Rocky Mountain regions, as in the preceding month. The barometer has fallen about .05 of an inch in the southern States, where the isobar of 30.10 corresponds with that of 30.15 of February. The pressure has increased .05 of an inch on the North Pacific coast and has diminished .05 of an inch in southern California.

The low area of 30.00, which was central north of the Lake region, has apparently moved to the northeast and beyond the limits of the stations of observation. The pressure had remained nearly stationary at the stations between the Mississippi River and the Rocky Mountains.

Departures from the normal values for the month.—Compared with the means of previous years, the pressure is slightly above the normal in the Southern States and the Lake region. It is also slightly above the normal in Southern California and about .1 of an inch above on the North Pacific coast. Compared with March, 1881, the barometer is about .3 of an inch higher in New England; from .15 to .25 of an inch higher in the Southern States east of the Mississippi, and about .2 of an inch higher in the Lake region. On the Pacific coast the pressure is .1 of an inch higher at San Francisco than in March, 1881.

Barometric ranges.—The range of pressure for the present month has varied from .2 of an inch to 1.48 inches, the least range being at Havana and the greatest range at Alpena. The range of barometer increases with the latitude, and from the coast toward the interior of the continent. In the several districts the barometric range has been as follows: *New England:* 1.42 inches at Burlington; 1.18 inches at Springfield; and .97 of an inch on the summit of Mount Washington. *Middle Atlantic States:* 1.17 inches at Williamsport; 1.16 at Washington; and 1.02 inches at Lynchburgh. *South Atlantic States:* .62 of an inch at Jacksonville; 1.00 inch at Kittyhawk; Florida, .31 of an inch at Key West; .42 of an inch at Punta Rassa; and .54 of an inch at Cedar Keys. *East Gulf States:* .65 of an inch at Port Eads; .79 of an inch at Montgomery. *West Gulf States:* .75 of an inch at Castroville; .99 of an inch at Shreveport; 1.01 inches at Little Rock; and 1.14 inches at Fort Gibson. *Ohio Valley and Tennessee:* .83 of an inch at Knoxville; .91 of an inch at Memphis; 1.01 inches at Cincinnati; and 1.16 inches at Pittsburgh. *Lower Lake Region:* 1.24 inches at Toledo to 1.40 inches at Oswego. *Upper Lake Region:* 1.17 inches at Chicago to 1.35 inches at Duluth; and 1.48 inches at Alpena. *Upper Mississippi Valley:* 1.08 inches at Saint Louis; and 1.27 inches at Saint Paul. *Missouri Valley:* 1.29 inches at Leavenworth to 1.30 inches at Yankton. *Extreme Northwest:* 1.30 inches at Moorhead to 1.38 inches at Fort Buford. *Northern Slope:* 1.17 inches at Fort Keogh to .76 inch at Cheyenne; 1.11 inches at Fort Assinaboine and .78 of an inch at Helena. *Middle Slope:* .81 of an inch at Denver; and 1.05 inches at Dodge City. *Southern Slope:* .66 of an inch at Stockton; and .96 of an inch at Fort Sill. *Northern Plateau:* 1.17 inches at Umatilla to .92 of an inch at Fort Missoula. *Middle Plateau:* .89 of an inch at Salt Lake; and .88 of an inch at Winnemucca. *Southern Plateau:* .34 of an inch at Fort Grant to .57 of an inch at Prescott. *North Pacific Coast:* 1.05 inches at Portland. *Middle Pacific Coast:* .67 of an inch at San Francisco to .81 of an inch at Red Bluff. *South Pacific Coast:* .30 of an inch at Campo to .57 of an inch at Yuma.

Areas of high barometer.—Nine well-defined areas of high barometer appeared within the limits of the Signal Service stations during the month of March, 1882. They were first observed in the Rocky Mountains, near the northern boundary of the United States, or on the North Pacific coast. Numbers I, II, III, VI, and IX passed directly to the eastward and north of the Signal Service stations, while the general course of numbers IV, V, VII, and VIII was to the southeast and toward the South Atlantic coast.

I.—The 7 a. m. telegraphic report of the 2d indicated that this area of high barometer was central near Deadwood, and the 11 p. m. report of the same date showed that it was moving slowly eastward, the region of greatest pressure being near Saint Vincent. From this point the course of the center was directly to the east as far as the Saint Lawrence Valley, where it disappeared rapidly in advance of low area No. II. Generally clear weather prevailed in the districts east of the Mississippi during the 3d, and the temperature fell below freezing in the Lake region and below zero in Manitoba.

II.—The midnight report of the 4th showed the barometer to be above the normal at all stations west of the Mississippi River, and on the morning of the 5th the pressure had increased to .4 of an inch above the normal at stations in Washington Territory, Oregon, and Dakota. This area passed from the North Pacific, over British Columbia, and was central near Fort Assinniboine on the afternoon of the 5th, the highest barometer then reported being 30.66.

On the morning of the 6th the temperature had fallen to —12° at Fort Garry, with a pressure of 30.61, but the center of this area continued to the westward and near Fort Buford, where the barometer had risen to 30.73. During the 6th and 7th this area passed over the northern portion of the United States with increasing pressure near the center, attended by cold northerly winds in the Lake region and violent northeast gales on the New England coast. At the 7 a. m. report of the 8th the barometer had risen to 30.80 at Parry Sound, and the temperature was below freezing as far south as Virginia. Cold northerly winds and light snow were reported in Indian Territory and northern Texas, where the winds were slowly shifting to easterly in the southwest quadrant of this area. The barometer continued unusually high on the New England and Middle Atlantic coasts until the morning of the 9th, when the winds shifted to southeast and southwest, indicating that this area moved to the southeast after passing the coast line.

III.—This developed in the region north of Dakota, where it was central at the midnight report of that date. It moved rapidly to the southeast during the 10th and 11th, following the general course of the Missouri Valley and passing over the southern States as an area of 30.40, attended by cold, fair weather. The barometer fell slowly at stations on the South Atlantic coast on the 12th, with southeast to southwest winds as this area disappeared to the eastward.

IV.—This probably developed in the Missouri Valley during the 11th, but its center could not be located on the tri-daily charts until midnight of the 12th, when the barometer was highest at Huron, Dakota. During the 13th the area extended over the States of the Mississippi and Ohio Valleys. On the 14th it apparently divided, one portion passing from Tennessee northeastward over the Lake region, while there was a slight increase of pressure on the South Atlantic coast. The barometer continued high in the districts on the South Atlantic coast until the 15th, when the area which passed northward over the Lake region disappeared to the eastward.

V.—The morning report of the 15th indicated the advance of this area from British America, and the reports received during the 14th from stations on the Pacific coast indicate that it developed in the higher latitudes east of the Rocky Mountains.

During the 15th and 16th the barometer continued high in the northern districts of the United States. This area passed to the eastward with increasing pressure at the center until it reached the Saint Lawrence Valley, when its course changed to the northeast. The following reports were received at midnight of the 7th: Father Point, barometer, 30.74; Anticosti, 30.76. The northeast winds at stations on the Atlantic coast and in the Saint Lawrence Valley show that this area continued its easterly course after passing to the east of the maritime provinces.

VI.—This appeared in the Northwest, when the storm, traced as low area No. VI, was central in Michigan on the 17th, but it passed to the east, north of the Lake region, without causing any marked change of pressure within the limits of the United States. The lowest temperatures observed occurred on the morning of the 19th. Saint Vincent reporting —8° at the morning observation, and Moorhead reporting —8° as the minimum for that date. This area of high pressure did not reach the Atlantic coast, but disappeared rapidly in advance of low area No. VII.

VII.—An extended area of cold, dry air appeared over the regions west of the 100th meridian on the 20th, the barometer reading on that date from .3 to .4 of an inch above the normal at stations in Utah, Idaho, Oregon, and Washington Territory. This area continued central in Utah or western Colorado, but a second area of high pressure was observed in Texas, where the rapid increase of pressure caused a severe norther on the Texas coast; the wind reached a velocity of 53 miles per hour at Indianola and 39 miles at Galveston between the 7 a. m. and 3 p. m. reports of the 21st. During the 22d the pressure increased over the southern States, where the barometer continued high until the 23d, with fair weather and winds shifting to the south and west.

VIII.—Although first referred to as central in the Upper Missouri Valley on the 23d, this area probably extended over the North Pacific coast and British Columbia. The temperature fell from 20° to 30° in the northwest on the 23d, as the pressure increased rapidly in that region. The following minimum temperatures were reported at 7 a. m. of the 24th: Saint Vincent,—25°; Fort Garry,—24°; Moorehead,—20°; Saint Paul,—5°. During the 24th this area passed over the Ohio Valley to the Middle Atlantic coast, attended by cool, fair weather in all districts east of the Mississippi River.

IX.—This appeared in Manitoba at midnight of the 29th, advancing in a southeasterly direction. On the morning of the 30th the temperature had fallen from 20° to 30° at stations in Iowa, Michigan, Wisconsin, and Minnesota. This area passed to the eastward over the Lake region, causing the barometer to rise to 30.50 in New England and the Middle Atlantic States. The temperature fell about 20° in these districts and 30° in the Saint Lawrence Valley. After reaching the coast, the course appeared to change from east to southeast, and when last observed, at midnight of the 30th, the isobar of 30.50 extended from Boston to Norfolk, with northwest winds in New England and southeast winds in the Middle Atlantic States.

Areas of low barometer.—Ten areas of low barometer appeared within the limits of the Signal Service stations during the month, sufficiently well defined to render it possible to locate the center of depression at each telegraphic report, from the date of first appearance until the disturbance finally passed beyond the station of observation. On Chart No. I will be found the tracks of the centers of areas of low barometer for the month of March, 1882. The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First observed.		Last observed.		Average hourly velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	°	°	°	′ °	
No. I	49	80	44	60	26.6
No. II	41	114	43	64	27.6
No. III	28	95	46	59	44.1
No. IV	48	82	43	62	39.1
No. V	46	103	37	75	33.3
No. VI	47	122	50	66	37.8
No. VII	55	127	45	75	34.8
No. VIII	56	95	49	67	38.1
No. IX	55	100	51	63	40.0
No. X	57	112	48	63	26.7

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The low area of 30.00, which was central north of the Lake region, has apparently moved to the northeast and beyond the limits of the stations of observation. The pressure had remained nearly stationary at the stations between the Mississippi River and the Rocky Mountains.

Departures from the normal values for the month.—Compared with the means of previous years, the pressure is slightly above the normal in the Southern States and the Lake region. It is also slightly above the normal in Southern California and about .1 of an inch above on the North Pacific coast. Compared with March, 1881, the barometer is about .3 of an inch higher in New England; from .15 to .25 of an inch higher in the Southern States east of the Mississippi, and about .2 of an inch higher in the Lake region. On the Pacific coast the pressure is .1 of an inch higher at San Francisco than in March, 1881.

Barometric ranges.—The range of pressure for the present month has varied from .2 of an inch to 1.48 inches, the least range being at Havana and the greatest range at Alpena. The range of barometer increases with the latitude, and from the coast toward the interior of the continent. In the several districts the barometric range has been as follows: *New England:* 1.42 inches at Burlington; 1.18 inches at Springfield; and .97 of an inch on the summit of Mount Washington. *Middle Atlantic States:* 1.17 inches at Williamsport; 1.16 at Washington; and 1.02 inches at Lynchburgh. *South Atlantic States:* .62 of an inch at Jacksonville; 1.00 inch at Kittyhawk; Florida, .31 of an inch at Key West; .42 of an inch at Punta Rassa; and .54 of an inch at Cedar Keys. *East Gulf States:* .65 of an inch at Port Eads; .79 of an inch at Montgomery. *West Gulf States:* .75 of an inch at Castroville; .99 of an inch at Shreveport; 1.01 inches at Little Rock; and 1.14 inches at Fort Gibson. *Ohio Valley and Tennessee:* .83 of an inch at Knoxville; .91 of an inch at Memphis; 1.01 inches at Cincinnati; and 1.16 inches at Pittsburgh. *Lower Lake Region:* 1.24 inches at Toledo to 1.40 inches at Oswego. *Upper Lake Region:* 1.17 inches at Chicago to 1.35 inches at Duluth; and 1.48 inches at Alpena. *Upper Mississippi Valley:* 1.08 inches at Saint Louis; and 1.27 inches at Saint Paul. *Missouri Valley:* 1.29 inches at Leavenworth to 1.30 inches at Yankton. *Extreme Northwest:* 1.30 inches at Moorhead to 1.38 inches at Fort Buford. *Northern Slope:* 1.17 inches at Fort Keogh to .76 inch at Cheyenne; 1.11 inches at Fort Assinaboine and .78 of an inch at Helena. *Middle Slope:* .81 of an inch at Denver; and 1.05 inches at Dodge City. *Southern Slope:* .66 of an inch at Stockton; and .96 of an inch at Fort Sill. *Northern Plateau:* 1.17 inches at Umatilla to .92 of an inch at Fort Missoula. *Middle Plateau:* .89 of an inch at Salt Lake; and .88 of an inch at Winnemucca. *Southern Plateau:* .34 of an inch at Fort Grant to .57 of an inch at Prescott. *North Pacific Coast:* 1.05 inches at Portland. *Middle Pacific Coast:* .67 of an inch at San Francisco to .81 of an inch at Red Bluff. *South Pacific Coast:* .30 of an inch at Campo to .57 of an inch at Yuma.

Areas of high barometer.—Nine well-defined areas of high barometer appeared within the limits of the Signal Service stations during the month of March, 1882. They were first observed in the Rocky Mountains, near the northern boundary of the United States, or on the North Pacific coast. Numbers I, II, III, VI, and IX passed directly to the eastward and north of the Signal Service stations, while the general course of numbers IV, V, VII, and VIII was to the southeast and toward the South Atlantic coast.

I.—The 7 a. m. telegraphic report of the 2d indicated that this area of high barometer was central near Deadwood, and the 11 p. m. report of the same date showed that it was moving slowly eastward, the region of greatest pressure being near Saint Vincent. From this point the course of the center was directly to the east as far as the Saint Lawrence Valley, where it disappeared rapidly in advance of low area No. II. Generally clear weather prevailed in the districts east of the Mississippi during the 3d, and the temperature fell below freezing in the Lake region and below zero in Manitoba.

II.—The midnight report of the 4th showed the barometer to be above the normal at all stations west of the Mississippi River, and on the morning of the 5th the pressure had increased to .4 of an inch above the normal at stations in Washington Territory, Oregon, and Dakota. This area passed from the North Pacific, over British Columbia, and was central near Fort Assinniboine on the afternoon of the 5th, the highest barometer then reported being 30.66.

On the morning of the 6th the temperature had fallen to —12° at Fort Garry, with a pressure of 30.61, but the center of this area continued to the westward and near Fort Buford, where the barometer had risen to 30.73. During the 6th and 7th this area passed over the northern portion of the United States with increasing pressure near the center, attended by cold northerly winds in the Lake region and violent northeast gales on the New England coast. At the 7 a. m. report of the 8th the barometer had risen to 30.80 at Parry Sound, and the temperature was below freezing as far south as Virginia. Cold northerly winds and light snow were reported in Indian Territory and northern Texas, where the winds were slowly shifting to easterly in the southwest quadrant of this area. The barometer continued unusually high on the New England and Middle Atlantic coasts until the morning of the 9th, when the winds shifted to southeast and southwest, indicating that this area moved to the southeast after passing the coast line.

III.—This developed in the region north of Dakota, where it was central at the midnight report of that date. It moved rapidly to the southeast during the 10th and 11th, following the general course of the Missouri Valley and passing over the southern States as an area of 30.40, attended by cold, fair weather. The barometer fell slowly at stations on the South Atlantic coast on the 12th, with southeast to southwest winds as this area disappeared to the eastward.

IV.—This probably developed in the Missouri Valley during the 11th, but its center could not be located on the tri-daily charts until midnight of the 12th, when the barometer was highest at Huron, Dakota. During the 13th the area extended over the States of the Mississippi and Ohio Valleys. On the 14th it apparently divided, one portion passing from Tennessee northeastward over the Lake region, while there was a slight increase of pressure on the South Atlantic coast. The barometer continued high in the districts on the South Atlantic coast until the 15th, when the area which passed northward over the Lake region disappeared to the eastward.

V.—The morning report of the 15th indicated the advance of this area from British America, and the reports received during the 14th from stations on the Pacific coast indicate that it developed in the higher latitudes east of the Rocky Mountains.

During the 15th and 16th the barometer continued high in the northern districts of the United States. This area passed to the eastward with increasing pressure at the center until it reached the Saint Lawrence Valley, when its course changed to the northeast. The following reports were received at midnight of the 7th: Father Point, barometer, 30.74; Anticosti, 30.76. The northeast winds at stations on the Atlantic coast and in the Saint Lawrence Valley show that this area continued its easterly course after passing to the east of the maritime provinces.

VI.—This appeared in the Northwest, when the storm, traced as low area No. VI, was central in Michigan on the 17th, but it passed to the east, north of the Lake region, without causing any marked change of pressure within the limits of the United States. The lowest temperatures observed occurred on the morning of the 19th. Saint Vincent reporting —8° at the morning observation, and Moorhead reporting —8° as the minimum for that date. This area of high pressure did not reach the Atlantic coast, but disappeared rapidly in advance of low area No. VII.

VII.—An extended area of cold, dry air appeared over the regions west of the 100th meridian on the 20th, the barometer reading on that date from .3 to .4 of an inch above the normal at stations in Utah, Idaho, Oregon, and Washington Territory. This area continued central in Utah or western Colorado, but a second area of high pressure was observed in Texas, where the rapid increase of pressure caused a severe norther on the Texas coast; the wind reached a velocity of 53 miles per hour at Indianola and 39 miles at Galveston between the 7 a. m. and 3 p. m. reports of the 21st. During the 22d the pressure increased over the southern States, where the barometer continued high until the 23d, with fair weather and winds shifting to the south and west.

VIII.—Although first referred to as central in the Upper Missouri Valley on the 23d, this area probably extended over the North Pacific coast and British Columbia. The temperature fell from 20° to 30° in the northwest on the 23d, as the pressure increased rapidly in that region. The following minimum temperatures were reported at 7 a. m. of the 24th: Saint Vincent,—25°; Fort Garry,—24°; Moorehead,—20°; Saint Paul,—5°. During the 24th this area passed over the Ohio Valley to the Middle Atlantic coast, attended by cool, fair weather in all districts east of the Mississippi River.

IX.—This appeared in Manitoba at midnight of the 29th, advancing in a southeasterly direction. On the morning of the 30th the temperature had fallen from 20° to 30° at stations in Iowa, Michigan, Wisconsin, and Minnesota. This area passed to the eastward over the Lake region, causing the barometer to rise to 30.50 in New England and the Middle Atlantic States. The temperature fell about 20° in these districts and 30° in the Saint Lawrence Valley. After reaching the coast, the course appeared to change from east to southeast, and when last observed, at midnight of the 30th, the isobar of 30.50 extended from Boston to Norfolk, with northwest winds in New England and southeast winds in the Middle Atlantic States.

Areas of low barometer.—Ten areas of low barometer appeared within the limits of the Signal Service stations during the month, sufficiently well defined to render it possible to locate the center of depression at each telegraphic report, from the date of first appearance until the disturbance finally passed beyond the station of observation. On Chart No. I will be found the tracks of the centers of areas of low barometer for the month of March, 1882. The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First observed.		Last observed.		Average hourly velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	°	°	°	′ °	
No. I	49	80	44	60	26.6
No. II	41	114	43	64	27.6
No. III	28	95	46	59	44.1
No. IV	48	82	43	62	39.1
No. V	46	103	37	75	33.3
No. VI	47	122	50	66	37.8
No. VII	55	127	45	75	34.8
No. VIII	56	95	49	67	38.1
No. IX	55	100	51	63	40.0
No. X	57	112	48	63	26.7

The mean latitude of the above storm tracks is about 10° north of the mean latitude of the storm tracks of March, 1881. Nos. II, VI, VII, and X probably passed from the Pacific coast in a southeasterly direction to the points where first located. No. III developed in the gulf, south of Texas, and all the others were first observed in the Northwest.

I.—This storm passed from the southwest during the last of the previous month, causing violent winds in the Lake regions and heavy rains in the Southern States. On the morning of the 1st it was central north of Lake Huron. From this point the movement was directly eastward, while the depression extended southward over the Middle Atlantic States and New England, with a rapid increase of gradient in the eastern quadrants, attended by dangerous east to south winds at stations on the Atlantic coast north of Wilmington, N. C. The storm increased in violence during the night of the 1st, the low area apparently dividing into two distinct depressions, one of which passed down the Saint Lawrence Valley, while the other passed from the Middle Atlantic coast northeastward over Nova Scotia during the 3d and 4th, where it disappeared as a severe storm.

Cautionary signals were ordered in advance of this storm at stations north of Cape Henry, and were fully justified by the violent winds which followed. Very heavy rain fell near the center of disturbance as it passed to the Saint Lawrence Valley and Nova Scotia. This storm increased in energy as it advanced, and the barometer, at the center, when last observed on the 4th, had fallen to 29.16 at Halifax, N. S.

The following abstracts from logs of vessels, probably show the progress of this storm during its passage eastward over the ocean: 4th, in 40° 32′ N., 67° 40′ W., steamship Egypt, WNW., moderate gale, squally; 40° 35′ N., 62° 10′ W., steamship Persian Monarch, fresh SE. to W. gale, heavy head sea; 5th, in 40° 31′ N., 65° 35′ W., steamship Persian Monarch, fierce gale tremendous sea.

II.—This depression was central in Colorado on the midnight of the 3d, but the telegraphic reports of the 2d indicate that it developed west of the Rocky Mountains. The barometer was high on the California coast on the 2d and 3d, and rain or snow prevailed in Washington Territory, Idaho, Oregon, and Utah. The depression became unusually well-defined as it passed to the eastward over Kansas, the isobar of 29.70 forming a circle, the diameter of which was about 300 miles. By the midnight report of the 4th the center of disturbance had reached Saint Paul, Minnesota, where the barometer had fallen to 29.42, accompanied by southeasterly gales. Heavy snow was reported at Moorhead, Bismarck, and Huron, Dakota, where the winds were from northeast to northwest, with velocities ranging from 38 to 43 miles an hour. The center remained near Saint Paul on the morning of the 5th; the gradient and winds having increased in the western quadrants of the storm. The advance of a high area from the northwest on this date was attended by a decided fall in temperature in Dakota, Minnesota, Nebraska, and Kansas. High winds continued in the Upper Lake region during the 5th, followed by clearing and cool weather after the winds had veered to westerly. The center of this storm passed over Lake Superior, moving in a northeasterly direction. At midnight the course changed to the east, and during the 6th it crossed the Saint Lawrence Valley near Montreal and passed over New England, causing rain in the Middle Atlantic States, and snow in New England and the Lake regions. The observer at Quebec reported: heavy snow and easterly gale.

Cautionary off-shore signals were displayed in advance of this storm at stations on the Atlantic coast north of Delaware Breakwater. The following maximum velocities were reported: Boston, 42, NW.; Sandy Hook, 44, NW.; Point Judith, R. I., gale; New Shoreham, 42, NW. Cautionary signals were also displayed at Grand Haven, Milwaukee, and Ludington, the stations on the lakes where signals are continued during the winter months.

When this depression reached the New England coast the barometer at the center read 29.74, or .45 of an inch higher than the lowest reading, when the center was near Saint Paul. This storm left the New England coast near Eastport on the 7th, moving directly east. On the 9th, the steamship City of Brussels reports, in lat. 43° 56′ N., long. 42° 42′ W., fresh WNW. gale and high sea.

No. III.—This is the only storm occurring during the month which developed south of the 30th parallel of latitude. A severe norther occurred in Texas on the 7th, the temperature falling below freezing in northern Texas, with light snow. The barometer continued high at all stations in the Gulf States, with north to east winds, until the morning of the 8th, when the cyclonic movement of the winds indicated the advance of this depression. Heavy rains fell in the Gulf States and in Tennessee on the 8th, as the storm center moved up the Mississippi Valley with increasing energy. The area of rainfall extended over the Ohio Valley, and snow or rain was reported from the Lake region and Upper Mississippi Valley. The course of the storm was northerly until the center reached Saint Louis, where its course changed to the northeast, the storm passing over the southern portion of the Lake region with great violence, causing dangerous winds and heavy rains in the southern quadrants, and snow in the northern quadrants of the storm. After reaching the Upper Saint Lawrence Valley, the course of the storm changed to easterly, and passed over New England on the 10th, with a pressure of 29.50 at the center, followed by NW. gales on the Atlantic coast. Cautionary signals had been displayed in advance at stations between Macon and Sandy Hook on the 8th, and were ordered for stations on the New England coast on the 9th. The following maximum velocities were reported: Hatteras, 40 SW.; Delaware Breakwater, 48 SW.; Sandy Hook, 38 W.; Newport, 34 NW. This storm was last observed as central near Sydey, where the barometer had fallen to 29.34 at the afternoon report of the 10th; but the barometric gradient had decreased and the light winds reported from stations in the maritime provinces indicated that the storm had lost much of its energy. On the 10th, the steamship Oder, in lat. 41° 59′ N., long. 62° 52′ W., reports moderate WSW. gale, rough sea.

IV.—This depression was first observed in the Lake region on the morning of the 12th, and probably developed in British America, west of Manitoba. It passed over the Saint Lawrence Valley with increasing energy during the 12th, attended by light snow in the Lake region, New England, and the northern part of the Middle Atlantic States. The barometer fell at the center as the depression moved to the eastward, the lowest reading being 29.10, which was reported from Sydney on the 13th. Northerly gales occurred on the Atlantic coast at stations north of Savannah, after the center had passed to the east of the coast line. Cautionary signals were ordered at stations on the coast between Hatteras and New York, on the 12th, and off-shore signals were ordered for these stations at midnight of the 13th.

The following maximum wind velocities were reported during this display: Breakwater, 50 miles NW.; Chincoteague, 46 NW.; Cape Henry, 44 NW.; Sandy Hook, 40 N. The following reports furnished through the co-operation of The New York Herald Weather Service, probably indicate the presence of this storm during its passage eastward over the ocean.

On the 13th steamship New York in lat. 34° 40′ N., long. 75° 15′ W., 29.65, WSW., gale, dark heavy clouds. 14th, in 37° 20′ N., 74° 50′ W., 30.15, NNW., hard gale, clear.

Ocean data from other sources as follows: On the 16th, steamship Gallia in lat. 44° 40′ N., long. 44° 25′ W., SW. to NW., fresh gale, high sea. 16th, steamship England in lat. 42° 41′ N., long. 45° 11′ W., heavy gale, heavy head sea.

V.—On the 13th, the barometer fell to 29.57 at Olympia, and 29.63 at Portland, Oregon, with rain and snow on the North Pacific coast. This depression probably developed in the Upper Missouri Valley on the 14th; while a second depression was central on the Pacific coast, north of Oregon. The 3 p. m. telegraphic report of the 14th indicated the southeasterly course of this storm, which was then central north of Yankton, enclosed by the isobar of 29.70. Pressure increased at the center during the 14th, and when the storm reached the Lake region the lowest isobar enclosing the center was 29.90, which had taken the form of an elongated ellipse with the longer axis in a northwest direction. The pressure continued to increase at the center during the 15th, when the storm passed eastward over the Ohio Valley, and the barometric gradient decreased, with a corresponding loss of energy, until the disturbance passed east of the coast line near Norfolk. After the winds shifted to northerly on the Middle Atlantic coast they increased in force, with a rapid increase of pressure.

VI.—The barometer fell at stations on the Pacific coast during the 15th, with winds shifting to southerly at all stations south of Oregon. This depression was central north of Washington Territory on the morning of the 16th; at the morning report of that date, the winds had shifted to northerly at Portland and Olympia, with the barometer ranging from 29.62 to 29.66. The midnight report of the 16th indicated that this depression had passed eastward to the Upper Missouri Valley, and the morning report of the 17th showed a well defined depression of 29.60 central near Fort Sully; southeasterly winds, with threatening weather and rain, prevailed in the Mississippi Valley from the Gulf coast northward to Lake Superior. This storm moved to the southeast until it crossed the Mississippi River, near Davenport, on the 18th, and then moved to the northeast over the Lake region. The pressure increased at the center after the disturbance reached the Saint Lawrence Valley, and the barometric gradient was slight in the eastern quadrants, although easterly gales occurred on the morning of the 19th in the Gulf of Saint Lawrence. This storm lost much of its energy before passing beyond the maritime provinces, but it was followed on the 19th by heavy snow and sleet in New England and Canada. Cautionary signals were ordered in advance of this storm at all stations on the lakes east of Marquette, and at all stations on the Atlantic coast north of Fort Macon. The following maximum velocities were reported: Mackinaw, 60 miles; Alpena, 36; Milwaukee and Rochester, 35; Point Judith, gale; Provincetown, 32; Eastport, 30.

The following reports furnished through the co-operation of The New York Herald Weather Service probably indicate the presence of this storm during its passage eastward over the ocean. On the 18th, steamship Celtic, in lat. 41° 02′ N., long. 69° 44′ W., SE., strong gale, threatening and rain; barometer fell from 30.20 to 29.70, with sea running very high; 18th, steamship City of New York, in lat. 41° 00′ N., long. 61° 28′ W., NNW. to SE., light winds to strong gale and very high sea. 19th, in lat. 40° 18′ N., long. 67° 41′ W., SE. to WNW., strong gale to light airs; at 6 a. m. to 10.30 a. m., dense fog; 21st, steamship Britannic, in lat. 46° 34′ N., long. 38° 15′ W., W. to SSW., fresh wind to strong gale. 22d, in lat. 44° 09′ N., long. 44° 10′ W., strong W. gale and very high sea. 23d, in lat. 42° 53′ N., long. 50° 58′ W., S. to WNW., moderate to strong wind.

VII.—This storm, like the preceding one, developed west of the North Pacific coast, where it appeared on the 19th. It moved rapidly during the 19th from Washington Territory to western Nebraska. On the 20th it was central near Omaha as a severe storm, and was moving slowly to the eastward with increasing barometric gradient and with a cyclonic movement of the winds within its limits. This storm also crossed the Mississippi River near Davenport, and during the 20th the central area became extended in a southeast and northwest direction, the lowest barometer reading 29.49, at Chicago. At the morning report of the 21st the barometer at Port Huron reached 29.49, and this storm continued with great violence over the entire Lake region, where the barometer was low, but the pressure was increasing rapidly in the Upper Mississippi and Lower Ohio Valleys. Heavy snow occurred in Michigan, Wisconsin, and Minnesota on the 20th and 21st. The afternoon report of the 21st indicated the presence of two depressions in the Lake region, one central near Rochester and one near Saugeen, both forming a part of this general disturbance, which was then elliptical in form, the longer axis pointing east and west. The midnight report of the 21st placed the center of this disturbance north of and near Toronto, Canada, the two minor depressions having united. The central area retained its elliptical form. Snow continued in New England, Ohio Valley, and Lake region during the 22d, followed during the night by clearing weather and high northwest winds on the coast. This storm passed east of the New England coast on the 22d. Cautionary signals were ordered at 5 p. m. of the 20th at stations in the Lake region and on the Atlantic coast, between Cape Henry and New York. At midnight of the same day signals were ordered at stations on the Atlantic coast north of New York.

The following maximum velocities indicate the force of this storm in the several districts: Milwaukee, 44 miles; Sandusky, 44 miles; Buffalo, 46 miles; Rochester, 53 miles; Cape May, 40 miles; Sandy Hook, 32 miles; Delaware Breakwater, 37 miles; New Shoreham, 36 miles.

The following reports, furnished through the co-operation of The New York Herald Weather Service, probably indicate the presence of this storm during its passage eastward over the ocean: On the 23d, steamship City of Montreal, in 40° 59′ N., 55° 25′ W., wind S. to WNW., fresh gale and beam sea, to moderate wind and heavy sea.

Ocean data from other sources: 22d, steamship Holland, in lat. 41° 46′ N., long. 54° 51′ W., strong NW. to SW. gale, heavy SSW. sea, ship rolling heavily. Same date, steamer Vaderland, in lat. 40° 15′ N., long. 55° 22′ W., heavy W. gale, high sea. Same date, steamship Britannic, in lat. 44° 09′ N., long. 44° 10′ W., strong W. gale, very heavy sea. 23d, steamship Holland, in lat. 41° 30′ N., long. 57° 56′ W., SSW. gale, high confused sea. Same date, steamship Elbe, in lat. 40° 53′ N., long. 55° 58′ W., strong SW. to NW. gale, high head sea.

VIII.—This depression probably developed in British Columbia, but did not appear in the northwest until midnight of the 22d, when the barometer was lowest in Manitoba. It passed rapidly toward the upper Saint Lawrence Valley on the 23d with increased energy, the barometer having fallen to 29.72 by midnight of the 23d, when the disturbance was central near Kingston. High northwest winds occurred in the Lake regions on the 23d, attended by fair weather and temperature below freezing. The morning report of the 24th showed a change in direction to the northeast. The center of disturbance was advanced to Farther Point, where the barometer had fallen to 29.53. South to west gales were reported from the Saint Lawrence Valley on the 24th, with heavy snows, and with temperature below zero at Rockliffe. The afternoon report of the 24th showed an increase of barometric gradients in the southern quadrants of this storm, the center being located east of Farther Point, where the pressure was 29.30. By midnight the area of lowest pressure had passed to the east of the maritime provinces, where the barometer was rising with westerly gales. At the same report the wind at the summit of Mount Washington attained a velocity of 82 miles, northeast; the afternoon report from Mount Washington, on the same day, gave the wind as 112 miles, north. Cautionary signals were ordered at stations on the Upper Lakes and Atlantic coast, at the afternoon report of that date.

The following maximum velocities were reported: Sandy Hook, 40 miles, NW.; Breakwater, 36, NW.; Buffalo, 38, SW.; Milwaukee, 36, W.; Alpena, 36, NW.; Shoreham, 36, NW.

The following reports, furnished through the co-operation of The New York Herald Weather Service, probably indicate the presence of this storm during its passage eastward over the ocean: On the 26th, steamship Arizona, in lat. 41° 26′ N., long. 60° 34′ W., fresh gale, latter part, snow-squalls, winds SSW. to NNW. 27th, steamship Adriatic, in lat. 43° 32′ N., long. 41° 55′ W., moderate gale, squally, heavy head sea, wind SW. to NW. 28th, in lat. 41° 28′ N., long. 47° 30′ W., moderate gale during day, winds west.

IX.—This depression was first observed in British America, north of Dakota, on the 24th, but its center could not be located on the tri-daily charts until the midnight report of that date, when the barometer was lowest near Fort Garry. From this point the course of this storm was almost due south, until reaching central Iowa, where, after a slight movement to the east during the eight hours following the afternoon report of the 25th, its course changed to the southwest, and at the following report its center was located in Kansas. During the 26th this storm moved over the Lake region developing great energy, the barometer falling to 29.30, the lowest isobar being elliptical in form, the longer axis pointing to the northeast. This storm was followed by a secondary depression in the lower Mississippi Valley on the 27th, which disappeared in advance of a high area from the northwest and a norther on the Texas coast. When this storm was central north of Lake Ontario dangerous westerly winds continued in the Lake region and on the Atlantic coast, as far south as Jacksonville. The barometer fell to 29.13 at Farther Point at midnight of the 27th, with wind SW., 55 miles, and to 29.12 at Anticosti, with light southeast winds. At the last report the wind at Farther Point was W., 33 miles.

Cautionary signals were ordered for stations on Lakes Erie, Michigan, and Huron at 4 p. m. of the 25th, and for stations on the Atlantic coast to New York on the morning of the 26th; and for stations between New York and Boston, at midnight of the 26th. Cautionary signals for Eastport, Portland, Oswego, and Rochester, were ordered on the morning of the 27th. The reports show that this was one of the most severe storms of the season, especially over the maritime provinces. The following maximum velocities were reported at Signal Service stations: Hatteras, 48, SW.; Kittyhawk, 47,SW.; Cape May, 44, S.; Delaware Breakwater, 48, S.; New Shoreham, 44, SW.; Rochester, 36, NW.; Sandusky, 36, SW.; Provincetown, 37, SW.

The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicate the presence of this storm, during its passage to the eastward over the ocean: On the 27th, steamship Bothnia, in lat. 42° 03′ N., long. 57° 50′ W., strong breeze with squalls and high head sea; wind northwest.

X.—This depression was at no time within the limits of the stations of observation, but passed to the east, north of the United States, first appearing north of Dakota on the 28th. The course of the storm changed to the southeast after reaching the longitude of the Lake region, and the disturbance became violent over Lakes Michigan and Superior, the wind reaching a velocity of 41 miles at Milwaukee on the 29th. The gradient increased rapidly in the south and west quadrants of this storm as it moved to the northeast down the Saint Lawrence Valley and disappeared on the 31st, attended by violent gales at Farther Point, Anticosti, and other stations in the northeast.

INTERNATIONAL METEOROLOGY.

International Charts IV and V accompany the present number of the Review. The former is published for January, 1880, and continues the series of that chart begun in January, 1877. The Beobachtungen auf dem Nordatlantischen Ocean, previously furnished this office through the courtesy of Prof. Dr. G. Newmayer, Director of the German Marine Observatory, has not been received for the month of January, 1880, and therefore was not used in the preparation of the present chart, as in the previous month. Chart V is prepared for the month of April, 1880, and continues the series of that chart, begun in November, 1877.

Chart IV shows the mean pressure, temperature, and the prevailing direction of the wind at 7.35 a. m., Washington, or 0.43 p. m., Greenwich mean time, for the month of January, 1880, over the northern and at certain isolated stations in the southern hemisphere. The pressure is generally high, and is considerably above the average. There are two areas of comparatively low pressure, the most decided occupying Iceland and the southern part of Greenland, lowest mean reading 29.58 at Stykkisholm; the least important, central over or near British Columbia, lowest mean reading, 29.90 at Olympia. The position of the former low area is nearly a constant feature of that part of the Arctic regions where for the past three years the mean pressure has not risen above 30.00, except as follows: April, 1877, Godthaab, 30.02; May, 1877, Stykkisholm, 30.04; August, 1877, Godthaab, 30.06; November, 1878, Stykkisholm, 30.06; December, 1878, Stykkisholm, 30.10. There are five decided areas of barometric maxima for the month, distributed as follows: In central Asia, 30.70; in central Mexico, 30.40; in eastern France and Western Germany, 30.40; in the Middle Atlantic States, 30.20; in 35° N., 60° W., 30.20. The high pressure over central Europe appears to result from an extension northeastward of the barometric maxima prevailing in the vicinity of the Azores and Madeira Islands and thence to the south and west along parallel 30° N.

Compared with the corresponding chart for December, 1879, the preceding month, there has been a general increase of pressure over Europe, Asia, and Northern Africa, within the limits of the stations of observation. The most marked increase is in eastern Siberia, where the small area of mean high barometer observed during the last month has extended, and now covers the northern portion of Asia, the pressure at the center having increased from 30.49 to 30.74. The area of mean low barometer continues central over Greenland, the pressure at the center having increased about .1 of an inch. Over the Atlantic, the barometer has fallen slightly between Newfoundland and the British Isles. The low area previously to the north of this latitude has extended southward along the 30th meridian west of Greenwich, while the gradient has increased decidedly from this meridian eastward towards the European coast. The high area of the North Atlantic has remained almost stationary, and is now central in lat. 35° N., long. 60° W., where the mean height of the barometer is 30.20. The area of high barometer which was central in Manitoba during the preceding month has disappeared, and the low area from the North Pacific now extends over the western portion of British America.

The following extreme monthly mean temperatures are given in Fahrenheit's scale: *Lowest:* York Factory, —28°; Nertschinsk, —22; Yeniseisk, —16°; Nikolaievsk on the Amoor, —11°; Barnaul, —6°; Fort Garry, —5°; Moose Factory, —2°. *Highest:* Fort Napier, 81°; Poona, 81°; Mauritius, 80°; Paramaribo, 79°; Puerto Berrio, 79°; Bridgetown, 78°; Navassa, 76°; Bombay, 76°; Fort de France, 75°; Kingston, 74°; Santiago de Cuba, 73°.

The prevailing direction of the wind over the United States was, northeasterly on the Atlantic coast; northerly on the Pacific coast south of Oregon; southerly in the Mississippi Valley and the Lake region; variable at the Rocky Mountain stations; southerly in the Plateau region and on the North Pacific coast. Over the Atlantic, the northeast trade-winds prevailed south of the 30th parallel; northwesterly winds over the North Atlantic west of the 40th meridian, and southwesterly, east of that meridian. In Europe: south to west in the British Isles; southeast to southwest in France and Spain; westerly in Russia. In India: variable and northerly on the coasts of China and Japan.

Compared with the corresponding month of January, 1879, the area of low barometer, central over Greenland, was more clearly marked. The pressure at the center was then 29.36, or about .2 of an inch below that reported for the present month. The pressure over the North Atlantic was also from .2 to .3 of an inch below that of January, 1880. The pressure is about .2 of an inch lower on the North Pacific coast, where in January, 1879, the barometer ranged from 30.10 to 30.20. In Central Asia the barometer is .3 of an inch higher and the temperature is 10° lower. The effect of the relative position of the high and low areas of pressure on the prevailing winds for the month is shown by comparing this chart with the corresponding chart of January, 1879, when the area of mean low pressure was central in the North Atlantic, south of its present position, thus causing east to south winds at stations in western Europe; while, during January, 1880, the winds in northern Europe are westerly, tending toward the secondary low area, which has taken the place of the high area extending over that region during the previous year.

Compared with January of preceding years, the temperature over the United States was above the normal in all districts east of the Rocky Mountains. It was from 10° to 15° above in the Upper Mississippi Valley, Missouri Valley, Lake region, Ohio Valley, and Southern States, and 8° to 9° in the New England and Middle Atlantic States. On the Pacific coast it was 7° below the normal for the month at Sacramento; 4° below at San Francisco; 1°.4 below at San Diego, and from 9° to 11° above at Umatilla and Boisé City.

The following table exhibits the mean temperature and mean pressure for the month of January, 1880, in the several countries of Europe and Asia, compared with the means as determined from the years 1877, 1878, and 1879:

Countries.	Mean temperature.		Mean barometer.	
	January, 1877-'78-'79.	January, 1880.	January, 1877-'78-'79.	January, 1880.
Algiers	56.9	52.9	30.15	30.24
Austria	35.3	27.8	30.08	30.32
British Isles	41.2	40.6	29.94	30.25
Denmark	30.5	34.2	29.98	30.22
France	44.4	37.6	30.07	30.37
Germany	33.5	30.0	30.05	30.30
India	75.9	69.5	29.87	29.96
Italy	50.3	43.6	30.03	30.26
Norway	29.0	32.4	29.84	29.89
Portugal	52.9	49.7	30.21	30.27
Russia	21.2	19.8	30.18	30.08
Sweden	25.6	26.0	29.98	29.92
Spain	53.8	51.2	30.16	30.27
Turkey	49.9	41.6	30.04	30.22

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of January, 1880, as compared with the means for the past three years:

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.		
	January, 1877-'78-'79.	January, 1880.	Departure.	January, 1877-'78-'79.	January, 1880.	Departure.
	°	°	°			
York Factory	—20.5	—27.6	— 7.1	30.04	29.98	—0.06
Godthaab	16.9	10.4	— 6.5	29.35	29.59	+0.24
Stykkisholm	29.5	32.9	+ 3.4	29.49	29.58	+0.09
Tromso	28.5	30.7	+ 2.2	29.70	29.55	—0.15
Thorshavn	37,6	41.4	+ 3.8	29.71	29.91	+0.20
Archangel	10.0	8.1	— 1.9	30.00	29.76	—0.24
Ekaterinburg	6.5	— 0.6	— 7,1	30.29	30.22	—0.07
Barnaul	— 2.9	— 6.0	— 3.1	30.50	30.63	+0.13
Yeniscisk	—11.4	—15.9	— 4.5	30.43	30.70	+0.27
Nikolaievsk on the Amoor	— 1.2	—10.5	— 6.3	....	....	....
Zi-Ka-Wei	33.9	35.1	+ 1.2	30.42	30.42	Norm'l
Tokei	35.4	33.1	— 2.3	30.10	30.09	—0.01
Pekin	21.3	19.9	— 1.4	30.44	30.48	+0.04
Nukuss	25.4	21.0	— 4.4	30.30	30.23	—0.07
Beirut	61.9	54.7	— 7.2	30.07	30.11	+0.04
Mauritius	82.7	80.2	— 2.5	29.94	29.98	—0.04
Fort Napier	77.4	80.6	+ 3.2	29.81	29.79	—0.02
Paramaribo	79.4	79.4	N'rm'l	30.00	29.93	—0.07
Funchal	64.8	64.6	— 0.2	30.25	30.18	—0.07
Ponta Delgado	61.3	60.3	— 1.0	30.23	30.02	—0.21
Bridgetown	80.5	78.3	— 2.2	30.01	29.91	—0.10
Navassa	78.5	75.8	— 2.7	....	....	....
Melbourne	62.6	63.5	+ 0.9	30.00	29.94	—0.06
Hobart Town	67.2	62.7	— 4.5	29.85	29.82	—0.03
Astrakhan	24.4	18.9	— 5.5	30.30	30.16	—0.14
Athens	53.4	46.9	— 6.5	30.04	30.26	+0.22
Tiflis	4.05	31.5	— 9.0	30.21	30.18	—0.03
Laghouat	56.1	51.1	— 5.0	30.15	30.29	+9.14
Fort de France	76.8	74.5	— 2.3	29.93	29.93	Norm'l
Lisbon	55.1	50.4	— 4.7	30.17	30.28	+0.11
Sandwick Manse	38.2	41.8	+ 3.6	29.85	30.12	+0.27
Malta	59.1	56.6	— 2.5	30.02	30.13	+0.11

Chart V.—This chart displays the tracings of the probable courses of 43 of the principal storm areas of the northern hemisphere for the month of April, 1880. The approximate paths of progressive movement are based upon about 700 daily simultaneous international observations. In addition, a mass of irregular data reaches this office in various ways, from the logs of vessels of the merchant marine of the North Atlantic and North Pacific oceans. Concerning the general distribution of the paths of the areas of barometric minima, the following is given:

Fifteen areas traversed portions of the United States, 4 of which entered from the Pacific Ocean, 2 over California, and 2 over British Columbia, the rest entering from the British Possessions. Two areas entered the northwest coast of the British Possessions and 2 others pursued peculiar paths skirting the northwestern coast of North America. Four areas crossed the ocean to the mainland of Northern Europe. Several others very probably made the passage but could not be traced on the chart owing to lack of data. Fifteen areas traversed parts of the North Atlantic Ocean. Nine areas appeared over Europe, being chiefly confined to the northern and southern parts of the continent. Three areas passed northeastward over eastern Asia and 4 in the vicinity of the Japan Islands.

Of the storms first appearing in North America, the following brief descriptions are given:

I.—This depression appeared in the Northern Slope on the 1st and passed rapidly southeastward into the Lower Missouri Valley, where it was central during the 2d. During the 3d and 4th it occupied the Lake region, and by the morning of the 5th became central in the Lower Saint Lawrence Valley inclosed by the isobar of 29.40; 6th, central over the Gulf of Saint Lawrence, passing thence northward to Greenland. During the 7th, 8th, and 9th the depression passed slowly eastward south of Godthaab, and on the 10th and 11th moved northeastward between Greenland and Iceland, disappearing near the parallel of 70° N. The following observations indicate the influence of its passage northeastward in the vicinity of these islands: 7th, Godthaab, 29.27, a fall of 0.34 inch, S., force 4, snowing; Stykkisholm, 29.91, a rise of 0.26 inch, W., force 2, cloudy. 8th, Godthaab, 29.28, S., force 4, snowing; Stykkisholm, 29.88, S., force 7, cloudy. 9th, Godthaab, 28.85, N., force 2, cloudy; Stykkisholm, 29.77, S., force 8, cloudy. 10th, Godthaab, 29.65, calm, cloudy; Stykkisholm, 29.95, calm, raining. 11th, Godthaab, 29.78, calm, fair; Stykkisholm, 29.89, S., force 8, cloudy.

II.—Central on the 1st in the Middle Pacific Coast region. The depression passed northeastward on that day and the following into Montana. On the 3d, central in northern Dakota, it probably merged with area III, at that time occupying the region north of Lake Superior.

III.—On the 1st the barometer at York Factory, B. A., fell 0.59 inch, wind NW., snowing, central area inclosed by the isobar of 29.60. During the 2d and 3d, the depression moved southeastward north of the Upper Lake region, while southerly winds with occasional rain prevailed from New England westward to Dakota. On the 4th the depression combined with area I, then central in the Lower Lake region.

VIII.—This depression appeared off the Middle Pacific Coast region in the vicinity of parallel 40° N., on the morning of the 2d, central area inclosed by the isobar of 29.40. San Francisco, 29.63, a fall of 0.28 inch, SW., light rain; Sacramento, 29.56, a fall of 0.36 inch, S., heavy rain; Red Bluff, California, 29.39, a fall of 0.51 inch, SE., light rain; Roseburgh, Oreg., 29.30, a fall of 0.57 inch, NW., light rain. 3d, depression central off the coast of Washington Territory, and moving northwestward. Olympia, 29.45, SW., threatening; Esquimalt, Vancouver's Island, 29.44, N., cloudy. During the remainder of the storm's course, the position of the central area of barometric minima on the various days is located with some uncertainity, owing to insufficient reports. 4th, depression probably central off the northwestern coast of British Columbia; barometer at Sitka rose 0.05 inch, wind SSE., cloudy. 5th, depression moving to the westward off the Island of Baranoff, Sitka, 29.67, a fall of 0.10 inch, SE., force 5, cloudy. 6th, Sitka, 29.67, E., force 3, cloudy. The further course of the depression could not be indicated upon the chart owing to the lack of reports.

IX.—Forming as a secondary depression to area II, this area became central on the morning of the 3d in the Middle Slope, inclosed by the isobar of 29.40. Dodge City, 29.18, a fall of 0.05 inch, N., foggy; North Platte, 29.22, a fall of 0.09 inch, SE., foggy. During the day the depression passed northeastward over the Lower Missouri Valley combining on the following day with area I, then central in the Lower Lake region.

XIII.—This depression appeared to result from the westward movement of area VIII. 8th, Sitka, 29.96, a rise of 0.15 inch, SSW., force 1, cloudy. 9th, Sitka, 29.69, a fall of 0.27 inch, WNW., force 1, cloudy. During the day the depression curved to the southeastward as it entered the British Possessions. 10th, Sitka, 29.49, a fall of 0.20 inch, calm, cloudy. After this day the course of the area could not be traced with accuracy owing to insufficient reports, but there seemed to be evidence that the depression formed a part of area XIX.

XIX.—Central in Manitoba on the morning of the 12th the depression passed southward through Minnesota, and during the 13th combined with area XXI, then central in the Lower Missouri Valley.

XIV.—This depression passed southeastward from the region of Hudson's Bay during the 8th and 9th, and on the following morning occupied the western part of the Lower Lake region, inclosed by the isobar of 29.60. By the morning of the 12th it was central, with diminished energy, over the Gulf of Saint Lawrence; 13th, probably central off the coast of Labrador. The influence of this depression as it passed northeastward over Greenland and Iceland is shown by the following reports: 13th, Godthaab, 29.26, a fall of 0.64 inch, S., force 2, snowing; Stykkisholm, 30.11, W., force 4, clear. 14th, Godthaab, 28.93, a fall of 0.33 inch, S., force 7, fair; Stykkisholm, 30.00, a fall of 0.11 inch, S., force 4, cloudy. 15th, Godthaab, 29.36, a rise of 0.43 inch, S., force 7, snowing; Stykkisholm, 29.81, a fall of 0.19 inch, SW., force 6, raining. 16th, Stykkisholm, 29.69, a fall of 0.12 inch, E., force 2, cloudy. During the day the depression disappeared to the north of Iceland in the vicinity of parallel 70° north.

XX.—This depression appeared on the 12th off the North Pacific Coast region, inclosed by the isobar of 29.80. Light rains with southwest to northwest winds prevailed in Oregon and Washington Territory. During this day and the following, the depression moved with slight energy northeastward along the western coast of British America, and on the 14th disappeared to the westward in the vicinity of the meridian of 140° west.

XXI.—Central on the 13th in the Middle Plateau region the depression passed rapidly east and northeast to the Upper Lake region, and by the morning of the 15th became central in the vicinity of James' Bay. Moose Factory, 29.21, a fall of 1.06 inches, SW., cloudy. During the 16th, 17th, and 18th the depression passed slowly northeastward over Davis Straits and Greenland, combining on the 19th with area XXIII, then central southwest of Iceland.

XXII.—This depression appeared off the northwestern coast of British America on the 14th, and passed slowly eastward into the interior, being central on the 16th north of British Columbia, inclosed by the isobar of 29.40. On the 18th the depression became central in the Saskatchewan Valley, and by the morning of the 20th occupied eastern Montana; 21st, central in the Middle Slope, inclosed by the isobar of 29.60. During the day the depression passed rapidly eastward over the Upper Lake region, disappearing on the 22d in the Lower Saint Lawrence Valley.

XXVI.—This depression appeared central in northern Texas on the 15th, inclosed by the isobar of 29.60. During this day and the following, the depression passed rapidly eastward to the Lower Lake region, and thence southeastward on the 17th off the New England coast; 18th, central south of Nova Scotia. In 38° 46′ N., 64° 22′ W., 29.77, NW., force 6, five hours' rain, hazy weather; in 41° N., 63° W., NW., strong gale. 19th, in 39° 38′ N., 58° 49′ W., 29.80, N., force 7, two hours' rain, hazy weather; in 42° 44′ N., 50° 56′ W.. 29.64, S., force 2, dense fog. During the 20th and 21st the depression passed rapidly northeastward west of the British Isles, and on the morning of the 22d was central east of Iceland. Stykkisholm, 29.34, SW., force 2, raining; Thorshavn, 29.40, NW., force 5, fair. 23d, central off the northwestern coast of Norway. From the 24th to the 27th the depression passed slowly eastward over northern Russia, and on the 28th became central in the valley of the Obi. 30th, the depression disappeared eastward beyond the Yenesi.

XXVIII.—Appearing on the 17th in the Middle Slope, the depression moved northeastward to the Upper Lake region, where it became central on the 19th. Marquette, 28.93, a fall of 0.87 inch, S., cloudy; Duluth, 28.89, a fall of 0.79 inch, N. W., cloudy; Escanaba, 29.00, a fall of 0.86 inch, SW., cloudy; Saint Paul, 29.07, a fall of 0.40 inch, NW., sleeting; 20th, central northeast of James' Bay, with diminished energy, and by the following morning the barometer at Godthaab, Greenland, had fallen 0.38 inch, wind shifting from NE., force 4, clear weather, to S., force 7, snowing. During the 22d the depression disappeared to the eastward north of Iceland.

XXIX.—This depression entered the northwestern coast of British America on the 18th and 19th, and by the morning of the 20th was central in British Columbia inclosed by the isobar of 29.60. During the day it combined with XXXI, then central in the Northern Plateau.

XXXI.—This depression entered the North Pacific Coast region on the 20th, and by morning of the 22d occupied central Montana. Virginia City, 29.38, calm, light snow. 23d, central in the Lower Missouri Valley, inclosed by the isobar of 29.00. Light to heavy snow, with southwest to northwest winds in Colorado and Montana, and light to heavy rain, with southeast to northeast winds in the Upper Mississippi and Lower Missouri Valleys and the Northwest. From the 24th to the 26th it passed slowly northeastward to the Upper Lake region, and, by the following morning, became central over the Gulf of Saint Lawrence. 28th, the depression central off the southern point of Greenland. Godthaab, 29.42, a fall of 0.33 inch, wind shifted from south to northeast. On the 30th, this depression combined with area XLI, while central off the eastern coast of Greenland.

XXXII.—This depression appeared central on the 20th in the Eastern Gulf States, and during the day moved rapidly eastward off the coast; 21st, probably central northeast of the Bermudas, moving thence rapidly northward to parallel 50° north. Changing its course slightly to the west of north, the depression, on the 25th, became central off the southeastern coast of Greenland. Godthaab, 29.26, a fall of 0.50 inch, NE., force 4, cloudy. During this day and the two succeeding, the depression skirted the eastern coast of Greenland and disappeared on the 27th in the vicinity of parallel 70° north.

XXXIX.—Central in the Saskatchewan Valley on the 27th, this depression moved southeastward into the Lower Missouri Valley, and thence northeastward to the Upper Lake region, in which latter district it was central on the 29th, inclosed by the isobar of 29.60. During the day it moved eastward to the Lower Saint Lawrence Valley, where it was central on the morning of the 30th. The continuation of this area will appear on Chart V for May, 1880.

XL.—This depression passed northeastward from its position on the morning of the 28th, in about 47° N., 148° W., to the northwestern coast of British America, which it entered during the 30th. The continuation of this area will probably appear on Chart V for May, 1880.

Of the storms first appearing over the Atlantic Ocean, the following brief descriptions are given:

IV.—This depression is a continuation of area XXV of Chart V for March, 1880. It was central on the 1st, southeast of Newfoundland, and passed northeastward between the parallels of 45° and 55° N. On the 4th, combined with area VI, then central off the northwestern coast of the British Isles; 4th, in 54° 30′ N., 17° W., 29.10, W., force 6, squally; in 52° N., 29° W., strong NW. gale; in 54° N., 18° W., hard WSW. to W. gales, with very high sea.

VI.—This depression is a continuation of area XXII of Chart V for March, 1880, central on the 1st east of Greenland, it moved slowly southeastward to the northern portion of the British Isles, where it was central on the 6th. During this period of movement the following reports show the influence of the depression: 1st, Stykkisholm, 28.81, SE., force 9, raining; Thorshavn, 29.41, SE., force 5, fair; North Unst, 29.53, SSE., force 8, cloudy. 2d, Stykkisholm, 28.74, E., force 7, raining; Thorshavn, 29.11, SE., force 7, raining; North Unst, 29.38, SSE., force 8, cloudy. 3d, Stykkisholm, 28.82, E., force 7, cloudy; Thorshavn, 29.03, SW., force 5, fair; North Unst, 29.22, SSE., force 8, cloudy. 4th, Stykkisholm, 29.06, NE., force 4, snowing; Thorshavn, 28.98, SE., force 7, fair; North Unst, 29.10, S., force 6, cloudy. 5th, Stykkisholm, 29.30, NE., force 7, clear; Thorshavn, 28.96, E., force 3, cloudy; North Unst, 29.04, S., force 6, cloudy; Monach Light-house, 28.81, WSW., force 7, cloudy. On the 6th throughout the British Isles the barometer fell below 29.35, with southwest to northwest winds, and with rainy or threatening weather. During the 7th, the depression moved rapidly southeastward into central Europe; 10th, central in northeastern Turkey, and on the 11th disappeared east of the Black Sea.

XII.—This was central on the 7th south of Nova Scotia. It was accompanied by northeasterly winds and clearing weather in the Canadian maritime provinces, except in Newfoundland, and by southerly winds, with rain, near parallel 40° N.: 8th, in 47° 45′ N., 40° 40′ W., 29.74, SSE., force 6, cloudy; in 42° 26′ N., 46° 43′ W., 29.79, W., force 4, moderate sea. During the 9th, the depression passed northward from near 55° N., 45° W., and on the 10th it combined with area I, then central between Greenland and Iceland.

XVIII.—This depression appeared and was central on the 11th, in about 45° N., 25° W., and, during this day and the following, it passed southeastward into northern Spain, where it became central on the 13th. Bilbao, 29.65, a fall of 0.14 inch, S., cloudy; Madrid, 29.74, a fall of 0.20 inch, S., 28 miles per hour, cloudy; Santiago, 29.48, a fall of 0.09 inch, SE., raining. It was central in Portugal on the 14th, and moved eastward over southern Spain, disappearing on the 15th on the western coast of the Mediterranean.

XXIII.—Central off the banks of Newfoundland on the 14th, the depression moved eastward along the parallel of 50° N., until the 16th, when it changed its course to the northeast, becoming central on the 19th south of Iceland. On the 20th, the depression moved from a position southwest of Iceland, northeastward over that island, and, on the 22d, combined with area XXVI. It was then central north of the Faroe Islands. The following ship reports give evidence of the influence of the depression: 14th, in 42° N., 55° W., NW. and WSW., heavy storm, snow, and hail squalls, very high sea; in 47° N., 32° W., SW. to NW., very stormy, rain and heavy sea; in 51° N., 30° W., SE. to SW. and NW., strong gales, very high sea, much water on deck, heavy rain, snow and hail at intervals; in 46° 44′ N., 47° 20′ W., W. and NW. strong gales, very heavy sea. 15th, in 45° N., 46° W., SW. to NW., strong gale, very high sea; in 47° N., 36° W., S. to NW., strong to heavy gale, thunder and lightning and heavy sea; in 49° N., 34° W., NW. and WNW., tempest, very high sea and breakers, hail and rain; in 47° 10′ N., 31° 25′ W., 29.55, WSW., force 6, very high sea, raining; in 49° 33′ N., 24° 40′ W., 29.76, S., force 5, cloudy and threatening; in 46° 33′ N., 37° 23′ W., 29.55, NW., force 8, rain and hail showers. 16th, in 48° 05′ N., 25° 50′ W., 29.27, WNW., force 6, very high sea, hailing; in 45° 35′ N., 25° 15′ W., 29.48, W., force 7, very high sea, rain and hail; in 45° 44′ N., 40° 14′ W., 29.64, W. to NW., force 8, rain and hail showers; in 45° N., 41° W., NW., heavy gale, frequent violent squalls, very high sea; in 45° N., 39° W., WNW., wild breaking sea, tremendous squalls; in 45° N., 41° W., NNW., strong gale, high sea, heavy squalls; in 48° N., 36° W., W. to NNW., tempest and hurricane, very high sea, much water on deck, slowed engines for fourteen hours and then hove to. 17th, in 48° N., 30° W., WNW. to WSW., strong, very high sea; in 44° N., 44° W., NW., heavy gale, frequent violent squalls, tremendous sea; in 44° N., 43° W., WNW., tremendous squalls, wild breaking sea; in 46° N., 40° W., W. to NW. and N., tempest, very high sea, much water on deck, rain and hail, slowed engines and hove to for six hours; in 48° 45′ N., 20° 05′ W., 29.05, SSW., force 2, raining; in 46° 50′ N., 21° 30′ W., 29.10, SW., force 7, drizzling rain; in 44° 50′ N., 42° 14′ W., 29.46, W. to NW., force 7 to 8, rain and hail showers, very high sea. 18th, in 49° 05′ N., 14° 30′ W., 29.28, SW., force 6, very high sea, showery; in 48° 35′ N., 17° 35′ W., 29.21, SW., force 7, very high sea, cloudy; in 51° N., 20° W., SW. to NW., strong gale, very high sea.

XXIV.—Central on the 14th in about 50° N., 30° W., this depression moved northeastward off the western coast of the British Isles during the 15th and 16th, accompanied by violent SW. to NW. gales, with rain and hail squalls. 17th, depression central north of the Shetland Isles, followed by southerly winds, with cloudy or rainy weather throughout nearly the whole of the British Isles. During this day and the following the depression filled up over Scandinavia.

XXXVII.—Central on the 25th in about 35° N., 55° W., this depression moved rapidly northeastward to the parallel of 50° N., disappearing on the 27th in an area of high pressure, 30.30, then prevailing off the western coast of the British Isles.

XLI.—This depression appeared central southeast of Newfoundland on the 28th. In 42° 14′ N., 54° 04′ W., 29.79 SW. to NW., force 3, foggy; in 42° 52′ N., 48° 51′ W., variable winds, five hours rain, foggy. During the 28th and 29th the depression moved northward to parallel 60° N., and on the 30th united with area XXXI, then central west of Iceland.

Of the storms first appearing in Europe the following brief descriptions are given:

V.—Central on the 1st over the North Sea, the depression moved slowly eastward over Denmark and southern Sweden, disappearing on the 4th south of the Gulf of Finland.

X.—Central in northern Italy on the 5th, the depression passed northeastward into southern Austria, where on the 6th the central area was inclosed by the isobar of 29.60. Passing north of Black Sea on the 7th, the depression disappeared during the 8th north of the Caspian Sea.

XI.—This barometric disturbance appeared as a slight depression in central Spain on the 6th. During this day and the following it moved northeastward over the Mediterranean, being central south of Sardinia on the 11th, southeast of Sicily on the 12th, and disappearing over Asiatic Turkey on the 13th.

XVII.—This depression appeared over northern Lapland on the 10th, and by the following morning was central east of the White Sea. On the 12th and 13th a large area of 29.40 prevailed in the vicinity of the Ural Mountains between the parallels of 50° and 60° N. 13th, Ekaterinburg, 29.27, a fall of 0.18 inch, wind shifting from WSW. to N., snowing; Tashkend, 29.56, a fall of 0.24 inch, calm, cloudy; Kasan, 29.56, a rise of 0.03 inch, N., cloudy. During the 14th and 15th the depression passed eastward over southwestern Asia, and on the 16th disappeared beyond the Yenisei.

XXV.—This depression entered the extreme portion of northern Norway on the 14th, and passed slowly southeastward north of the White Sea, being central on the 17th in northwestern Siberia. On the 19th the depression disappeared eastward beyond the Yenisei.

XXXIII.—Central on the 20th southeast of the White Sea, the depression continued the same direction of movement until the following day, when it changed to the northeast, and on the 22d became central in the valley of the Obi. On the 23d the depression disappeared eastward beyond the Yenisei.

XXXVIII.—This depression first appeared in southern France on the 26th, and moved thence northeastward over northern Italy and southern Austria, being central on the 29th north of the Black Sea. On the 30th disappeared over southeastern Russia.

XLII.—Central on the 28th over Finland, the depression passed slowly eastward along the parallel of 60° N., and, on the 30th, became central in northwestern Siberia. The continuation of this area will probably appear on Chart V, for May, 1880.

Of the storms appearing on the Asiatic coast the following brief descriptions are given:

VII.—This depression is probably a continuation of area XXVII, of Chart V, for March, 1880.

XV.—Appeared central south of the Island of Formosa on the 8th, and moved thence northeastward, being, on the 10th, central north of the Island of Kinsin. During the day the depression moved southeastward over Japan and disappeared on the 11th in about 30° N., 140° E.

XXX.—This depression passed northeastward from the province of Amoor on the 19th, disappearing over the Okhotsk Sea on the 20th.

XXXIV.—Central south of the Amoor in the province of Manchooria on the 21st, the depression moved northeastward over the province of Amoor and, on the 23d, disappeared over the Okhotsk Sea. 22d, Nikolaievsk, 29.70, a rise of 0.01 inch, wind changed from calm to NE., cloudy. Nertchinsk, 30.14, a rise of 0.20 inch, wind shifted from ESE. to WSW., calm, clear.

XXXV.—This depression appeared on the 21st over the Yellow Sea, inclosed by the isobar of 29.70. At Japanese stations the winds shifted from SE. to NE. with rapidly falling barometer; Nagasaki, 29.80, a fall of 0.38 inch, ENE., raining, 2.21 inches rainfall in past twenty-four hours; 22d, central over the southern portion of the Japan Sea; Hiroshima, 29.64, a fall of 0.42 inch, S., cloudy, 18.19 mm. rainfall in past twenty-four hours; Nagasaki, 29.74, a fall of 0.06 inch, WSW., cloudy; Tokei, 29.95, a fall of 0.32 inch, SSW., raining, 21.72 mm. rainfall in past twenty-four hours; Wakayama, 29.64, a fall of 0.53 inch, E., raining, 6.50 mm. rainfall in past twenty-four hours; 24th, Tokei, 29.47, a fall of 0.48 inch, SW., clear; Wakayama, 29.61, a fall of 0.03 inch, S., fair; Hiroshima, 29.65, a rise of 0.01 inch, W., clear; Nagasaki, 29.77, a rise of 0.03 inch, WSW., cloudy. During the 24th the depression disappeared east of the Island of Yesso.

XXXVI.—This depression appeared central in the western portion of the Province of Manchooria on the 25th; Nertchinsk, 29.61, a fall of 0.41 inch, calm, cloudy; 26th, central in the Province of Amoor; Nertchinsk, 29.81, a rise of 0.20 inch, NW., clear; Nikolaievsk on the Amoor, 29.76, calm, clear; 27th, Nikolaievsk, 29.58, a fall of 0.18 inch, E., cloudy; Nertchinsk, 29.88, NW., clear; 28th, Nikolaievsk, 29.52, a fall of 0.06 inch, W., cloudy. On the following day the depression disappeared to the eastward over the Okhotsk Sea.

XLIII.—This appeared as a slight but extensive depression over northeastern China and the Japan Sea on the 29th and 30th, a continuation of which will probably appear on Chart V, for May, 1880.

Ocean ice.—February 12, 1882, in 46° 50′ N., 47° 00′ W., bark Johannes passed two large icebergs and large quantities of field ice. February 18th, in 46° N., 49° W., bark Nova Scotia passed through large quantities of drift ice; 22d, in 44° 60′ N., 45° 30′ W., bark Argonaut passed large iceberg 70 feet high. February 23d, the steamship Helvetia reported having met with immense fields of ice floating northward to the banks; in 47° N., 47° W., she was completely surrounded by ice; 24th, steamship Bavarian, in 45° N., 48° W., passed an iceberg and large quantities of drift ice; same date, in 45° 30′ N., 49° 00′ W., steamship St. Germain was in an immense ice-field; 23d, in 45° 20′ N., 46° 00′ W., steamship New York City passed large quantities of pack ice and several icebergs from 60 to 300 feet high; 26th, in 46° 00′ N., 47° 54′ W., steamship City of Lincoln passed ice; same date, in 43° 10′ N., 49° 00′ W., steamship City of Paris passed field ice and one small iceberg; in 44° 00′ N., 49° 00′ W., steamship Palestine passed large quantities of field ice and small icebergs; 27th, in 46° 20′ N., 47° 00′ W., steamship Rialto ran into a field of ice and several large icebergs; ice being so heavy stove in both bows, and was obliged to steer SE. for 200 miles to clear the ice; 28th, in 43° 59′ N., 48° 32′ W., steamship Main passed a large ice-field; same day, in 46° 26′ N., 41° 25′ W., steamship Persian Monarch passed large quantities of ice; March 1st, in 44° 46′ N., 49° 29′ W., steamship Elbe passed several icebergs and large ice-fields; March 1st, in 43° 35′ N., 49° 10′ W., steamship Germania passed large fields of ice. The steamship Istrian reported: March 1st and 2d, passed through large quantities of ice, extending in length from forty to fifty miles. The steamship Rotterdam, between 46° 30′ N., 46° 00′ W., and 44° 00′ N., 52° 00′ W., passed 27 icebergs and had to cross an ice-field; in 44° 58′ N., 46° 41′ W., steamship Persian Monarch passed a quantity of field ice. March 2d, in 43° 45′ N., 48° 40′ W., steamship Lake Champlain passed large quantities of field ice and several icebergs; 7th and 8th, steamship Oder between 45° 09′ N., 48° 50′ W., and 44° 52′ N., 50° 03′ W., passed numerous icebergs and floating ice. Steamer Otranto reported: March 6th (no position given), at 2 p. m. passed an iceberg of great size, and from that time up to 10.30 p. m. passed 16 others and field ice extending as far as the eye could reach; 10th, in 47° 00′ N., 46° 30′ W., steamship Thornholme passed a large iceberg, also ice-field 5 or 6 miles long; also on 11th, at 6 a. m., passed two very large icebergs, one of which was estimated to be 4 miles in length and was very high; 18th, in 44° 04′ N., 47° 53′ W., steamship Salier passed several large icebergs; 21st, bark Fremad, two days' sail from New York, passed through large field of ice. The steamship Newfoundland, at Saint Johns, Newfoundland, March 28th, reports two vessels jammed in the ice 30 miles SW. of Cape Pine, also heavy ice everywhere on the coast; 14th, in 43° 29′ N., 49° 05′ W., steamship Batavia passed an iceberg; 10th, in 42° 30′ N., 50° 00′ W., steamship City of Brussels passed a small iceberg; 13th, in 44° 39′ N., 47° 36′ W., steamship Devonia passed several small icebergs; 12th, in 44° 09′ N., 49° 12′ W., steamship Donau passed two icebergs; 14th, in 42° 31′ N., 50° 05′ W., steamship Erin passed an immense iceberg; 17th, in 43° 35′ N., 49° 10′ W., steamship Glamorgan passed two large icebergs, from 300 to 500 feet long and 100 feet high; 11th, in 45° 58′ N., 48° 40′ W., steamship Iberian passed through large quantities of field-ice and saw several large icebergs; 15th, in 43° 47′ N., 49° 60′ W., steamship Lake Manitoba passed three icebergs. March 3d, bark Plymouth, in 43° 40′ N., 50° 25′ W., passed through about 20 miles of field ice and saw several icebergs; 19th, in 46° 30′ N., 47° 30′ W., steamship Limosa passed through heavy field ice. The whaling steamer Esquimaux arrived at Saint John's, from Dundee, February 28th, and reports having been 13 days among vast fields of ice that stretched SE. and S. over 200 miles from the Newfoundland coast. The pack caught her tightly and she remained in it until she drifted up to Saint John's Harbor. At last accounts five steam-whalers are visible from Cape Spear locked in the ice and drifting helplessly southward. Between Cape Race and Cape Bonavista there are now driving southward no less than a hundred and fifty icebergs, and their rate is about 2½ miles per hour.

TEMPERATURE OF THE AIR.

The distribution of mean atmospheric temperature over the United States and Canada for the month of March, 1882, is exhibited on Chart II by the dotted lines in black. The table of mean comparative temperatures in the lower left-hand corner of the chart shows in the first column the average temperature for the month from the various districts, as determined from observations taken at Signal Service stations during the month of March of previous years; the second column shows the mean temperature for the current month; the third column shows the departure of the mean temperature of the current month from the mean of several years. The temperature is above the normal in all districts east of the Rocky Mountain range, and below the normal in the districts on the Pacific coast, except in Oregon and Washington Territory, where it has averaged about 8° above the mean. It has ranged from 4° to 5° above the normal in the Southern States, Ohio and Missouri Valleys; about 3° above in the Middle States and Lake region; about 5° below in the Middle Plateau region; and about 1° below in California.

Deviations from mean temperature.—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of Chart II. The following items of importance, in connection with this subject, are reported by voluntary observers: *Connecticut:* Southington, mean temperature varies less than 1° from the average of past twelve years and has not been marked by extremes. *Illinois:* Riley, mean temperature 33°.8 or 3°.8 above the average of past twenty-one years; higher mean temperatures occurred in 1868, '71, '78, and '79. *Indiana:* Vevay, mean temperature 50°.27 or 7°.47 above the average for past seventeen years. Mean temperature of winter, beginning with December, 1881, and ending February 28, 1882, is 41°.23 or 7°.9 above the average winter mean for past seventeen years. *Iowa:* Clinton, mean temperature slightly above the average. *Kansas:* Lawrence, mean temperature 46°.90, or about 5°.42 above the average of past fourteen years; mean temperature for the month at 7 a. m., 40°; at 2 p. m., 55°.93; at 9 p. m., 45°.85. Yates Center, mean temperature 46°.5, or 8°.4 above the average of past two years. Wellington, mean temperature 47°.4, or 3°.3 above the average of the past three years and 2°.2 below the mean of March, 1879. *Maine:* Gardiner, mean temperature 28°.91, or 0°.91 below the average of past fifty-six years. Mean temperature of winter (from December, 1881, to March, 1882, both inclusive) is 24°.35, or 1°.24 above the average of the past forty-six years. The lowest temperature of the past winter, —27°, occurred January 25; the lowest on record at this place, —40°, occurred in January, 1857; the highest minimum temperature for any winter during that period, —12°, occurred in January, 1845. During the past winter the temperature fell below zero on 21 dates; during the winter of 1855–6, on 59 dates, and during the winter of 1841–2, on only 10 dates. *Maryland:* Fallston, mean temperature 41°.52, or 2°.67 above the average of past eleven years; during that period the highest mean, 46°.20, occurred in 1871, and the lowest, 32°.90, occurred in 1872. *Michigan:* Thornville, mean temperature 35°.9, or about 5° above the average of the past fifteen years. *Missouri:* Saint Louis, Missouri Weather Service reports mean temperature 47°.6, or about 4° above the average of the past forty-five years. During that period the mean of March, 1882, has been exceeded thirteen times; the highest mean, 56°.5, occurred in 1842; the lowest, 27°.5, in 1843; Protem, mean temperature 55.45, the highest since 1860. *New Hampshire:* Contoocookville, mean temperature 31°.5 is about the average for March for the past twelve years. *New York:* Waterburgh, mean temperature 33°.1, which is the highest that has occurred during the past eleven years with the exception of March, 1878, mean 37°.4; North Volney, mean temperature 51°.59, or 2°.76 above the average of past fourteen years. During that period the highest monthly mean, 37°.39, occurred in 1878; lowest, 21°.15, occurred in 1872. *Ohio:* North Lewisburgh, mean temperature 42°.0, or 3°.3 above the average of fifty-one years. *Pennsylvania:* Wellsborough, mean temperature much higher than for any previous year since 1856. *Virginia:* Wytheville, mean temperature 45°.6, or 3° above the average of past eighteen years. *West Virginia:* Helvetia, mean temperature 44°.68, or 4°.67 above the average of the past six years.

Ranges of temperature at Signal Service stations.—Monthly ranges of temperature during the month of March varied from 19° to 89° at stations east of the Rocky Mountains, and from 32° to 75° at stations on the Pacific coast. The smallest ranges are: Key West, 19°; Port Eads, 23°; Punta Rassa, 27°; New Orleans, 28°; San Francisco, 32°; Mobile and Hatteras, 33°; Delaware Breakwater, 34°; Brownsville, Tex., 37°; San Diego, 39°. The largest: Fort Buford, Dak., and Fort Shaw, Mont., 89°; Fort Benton, Mont., 88°; Bismarck, Dak., 87°; Fort Bennett, Dak., 84°; Huron, Dak., 81°; Fort Assinniboine, Mont., and Yankton, 80°; Fort Missoula, Mont., and Fort Washakie, Wyo., 78°; Fort Keogh, Mont., 76°; Fort Custer, Mont., and Eagle Rock, Idaho, 75°. The daily ranges varied in the different districts as follows: New England, Mount Washington, 36° on 28th; Burlington, 29°, 28th; Boston, 28°, 20th; New London, 27°, 24th. Middle Atlantic States, New York, 24°, 19th; Cape May, 28°, 29th; Albany, 22°, 18th; Washington, 30°, 26th; Norfolk, 31°, 26th. South Atlantic States, Augusta, 35°, 3d; Kittyhawk, 32°, 30th; Charleston, 32°, 3d; Savannah, 28°, 24th. Florida Peninsula, Key West, 13°, 10th; Punta Rassa, 23°, 2d; Cedar Keys, 24°, 23d. Eastern Gulf States, 20°, 31st; Vicksburgh, 25°, 29th; Montgomery, 28°, 2d. Western Gulf States, Mason, Tex., 39°, 30th; San Antonio, Tex., 37°, 10th; Fort Gibson, 34°, 1st, Denison, Tex., 33°, 28th; Indianola, 23°, 9th; Galveston, 16°, 9th, 29th. Ohio Valley and Tennessee, Knoxville, 35°, 2d; Louisville, 30°, 27th; Nashville, 31°, 29th; Columbus, 29°, 15th, 26th; Memphis, 29°, 25th; Indianapolis, 28°, 9th, 23d. Lower Lake region, Rochester and Cleveland, 33°, 29th; Sandusky, 30, 29th; Oswego, 28°, 29th. Upper Lake region, Escanaba, 33°, 23d; Alpena and Port Huron, 32°, 23d; Duluth, 30° on 24th; Grand Haven, 20°, 27th. Upper Mississippi Valley, Des Moines, 41°, 25th; Keokuk, 34°, 25th; La Crosse and Saint Paul, 31°. 31st. Missouri Valley, Yankton, 49°, 22d; Fort Bennett, 50°, 31st; Omaha, 38°, 22d, 25th; Leavenworth, 35°, 14th. Extreme Northwest, Fort Buford, 49°, 7th; Bismarck, 50°, 27th; Moorhead, 42°, 24th; Northern Slope, Cheyenne, 39°, 19th; North Platte, 42°, 24th; Fort Keogh, 44°, 21st, 30th; Middle Slope, Pike's Peak, 25°, 21st; Fort Elliott, 42°, 2d; Dodge City, 46°, 22d. Denver, 39°, 24th. Southern Slope, Concho and Fort McKavett, 41°, 30th; Stockton, 46°, 5th; Fort Griffin, 44°, 28th; Henrietta, 34°, 28th. Northern Plateau, Umatilla, 38°, 31st; Eagle Rock, 39°, 22d; Fort Missoula, 43°, 31st. Middle Plateau, Winnemucca, 36°, 31st; Pioche, 32°, 31st; Salt Lake City, 30°, 31st. Southern Plateau, Prescott, 50°, 22d; Phœnix, 47°, 21st; Tucson, 44°, 31st; La Mesilla, 50°, 2d; Santa Fé, 32°, 21st; Silver City, 44°, 10th. North Pacific Coast region, Olympia, 25°, 12th; Portland, 31°, 30th; Roseburgh, 37°, 30th. Middle Pacific Coast region, San Francisco, 21°, 27th; Sacramento, 26°, 31st; Red Bluff, 33°, 22d. South Pacific Coast region, San Diego, 30°, 23d; Campo, 50°, 23d; Yuma, 39°, 29th.

Frosts.—In various districts they were reported on the following dates: New England, 3d, 5th, 7th to 27th, 29th, 31st; Middle Atlantic States, 3d to 9th, 11th, 13th to 20th, 22d to 26th, 28th, 29th, 31st; South Atlantic States, 11th, 14th to 17th, 23d, 25th, 26th, 29th; East Gulf States, 11th, 14th, 22d, 23d, 29th; West Gulf States, 1st, 6th to 11th, 13th, 21st to 24th, 27th, 28th; Rio Grande Valley, 9th, 10th; Ohio Valley and Tennessee, 1st, 2d, 4th to 8th, 10th, 11th, 13th to 17th, 21st to 26th, 28th to 31st; Lower Lake region, 2d to 26th, 28th to 31st; Upper Lake region, 1st to 31st; Extreme Northwest, 1st to 31st, Upper Mississippi Valley, 1st, 2d, 3d, 5th to 15th, 19th to 25th, 27th to 31st; Missouri Valley, 1st to 16th, 19th, 21st to 24th, 26th, 28th to 31st; Northern Slope, 1st to 13th, 15th to 26th, 29th; Middle Slope, 1st to 30th; Southern Slope, 7th to 10th; Southern Plateau, 1st to 31st; Middle Plateau, 1st to 24th, 26th, 27th, 31st; Northern Plateau, 1st to 7th, 9th to 12th, 16th to 21st; North Pacific Coast region, 1st, 2d to 13th, 18th to 21st, 23d; Middle Pacific Coast region, 3d, 4th, 9th, 19th to 23d; South Pacific Coast region, 1st, 4th to 8th, 10th, 15th, 17th, 18th, 20th to 23d. Frosts injurious to vegetation were reported as follows: Charlotte, N. C., 23d, peas entirely killed; peach buds and wheat injured. 25th, further injury to wheat and fruit by frost. Charleston, S. C., on 23d, light frost damaging strawberries and early vegetation. Sacramento on 20th, frost killing tender vegetation. Coleman City, Tex., 8th, all kinds of young plants and the buds of fruit trees were frost bitten. Henrietta, Tex., 9th, peach crop much injured by severe weather of past two days.

Ice.—Regarding its formation in the northern sections, this subject is considered elsewhere in the Review, under the head of "Ice in Rivers and Harbors." The following are exceptional cases of its formation in the southern sections of the country:

Augusta, Ga., 23d; Mason, Tex., 7th and 8th; Indianola, 9th, 10th; Fort Apache, Arizona, 8th; ice formed during night, an unusual occurrence for this season at this place; Red Bluff, 20th, formed during night on quiet water; Ashwood, Tenn., 11th, 14th, 23d, 25th; Austin, Tenn., 23d, 25th; Murfreesborough, Tenn., 14th, 23d, 25th; Coleman City, Tex., 7th.

Low temperatures.—Fort Stevenson, Dak., 20th, worst blizzard of whole winter; 21st, blizzard still raging; Eagle Rock, Idaho, 6th, coldest weather ever experienced here at this season; 7th, stock-men complain of severe losses on account of severe cold weather.

Table of comparative minimum temperatures for the month of March.

State or Territory.	Minimum for March, 1882, Signal Service.		Lowest since Signal Service stations were opened—3 to 11 years.			Lowest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°	°		°	°	*Years.*
Alabama	Montgomery	42	Montgomery	25	1873	Huntsville	11		9
Arizona	Prescott	13	Prescott	—8	1876	Fort Canby	—1		12
Arkansas	Little Rock	39	Little Rock	32	'80,'81	Fort Smith	—8		22
California	Campo	15	Campo	19	1880	Fort Bidwell	0		11
Do						Fort Crook	2		12
Colorado	Pike's Peak	—24.5	Pike's Peak	—29	1875	Fort Garland	—10	1875	29
Do	West Las Animas	6	Colorado Springs	—4	1875	Fort Lyon	—10	1880	22
Do						Pagosa Springs	—20	1881	1
Connecticut	New Haven	13	New Haven	6	'75,'76	Colebrook	—10		10
Do						New Haven	—9		75
Dakota	Fort Stevenson	—23	Pembina	—31	1880	Fort Abercrombie	—40		19
Do			Fort Stevenson	—28	1879	Fort Buford	—40	'67,'70	16
Delaware	Delaware Breakwater	28	Delaware Breakwater	25	1880	Fort Delaware	5		45
Do						Milford	5	1877	4
District of Columbia	Washington	23	Washington	4	1873	Washington	—5		49
Florida	Cedar Keys, Jacksonville, and Pensacola.	47	Jacksonville	31	'73,'76	Fort Barrancas	28		61
Do			Lake Village	25	1873	Fort King	27		10
Georgia	Atlanta	34	Augusta	22	1873	Atlanta	12		4
Do						McPherson Barracks	12		6
Idaho	Eagle Rock	—16	Boisé City	10	1879	Fort Hall	—1		5
Illinois	Champaign	21	Chicago	1	1873	Fort Armstrong	—14		9
Do						Rock Island Arsenal	—14		11
Do						Belvedere	—20	1877	5
Indiana	Indianapolis	24	Indianapolis	2	1873	Spiceland	0		15
Do						Kokoma	—10	1875	1
Indian Territory	Fort Supply	17	Fort Gibson	10	1878	Fort Gibson	7		55
Do						Camp Supply	—2	1876	2
Iowa	Des Moines and Davenport.	10	Dubuque	—10	1875	Algona	—25		20
Do			Keokuk	—10	1873	Vale	—20	1880	7
Kansas	Dodge City	14	Dodge City	—8	1880	Fort Riley	—20		21
Do						Fort Leavenworth	—9		52
Kentucky	Louisville	31	Louisville	3	1873	Newport Barracks	3		29
Do			Lexington	—1	1873				
Louisiana	Shreveport	41	Shreveport	26	1876	Fort Jesup	16		23
Do						Baton Rouge	26		58
Maine	Eastport	10	Eastport	—1	'75,'80	Gardiner	—20		42
Do						Brunswick	—19		53
Maryland	Baltimore	26	Baltimore	5	1873	Fort McHenry	0		52
Massachusetts	Boston and Springfield	15	Springfield	—1	1875	Williamstown	—12		62

Do						Billerica	—14	1875	11
Michigan	Alpena	0	Escanaba	—20	1875	Fort Brady	—32	1875	60
Do						Ontonagon	—22		11
Minnesota	Saint Vincent	—25	Breckenridge	—32	1873	Fort Ripley	—37		18
Do						Minneapolis	—27		12
Mississippi	Vicksburgh	43	Vicksburgh	27	1876	Columbus	20		10
Missouri	Springfield	24	Saint Louis	8	'73,'76	Harrisonville	—12		6
Do						Saint Louis	—6		39
Montana	Fort Shaw	—18	Fort Benton	—42	1876	Fort Ellis	—36		13
Do						Fort Benton	—42	1876	12
Nebraska	Omaha	5	North Platte	—21	1880	Glendale	—0	1868	2
Do						Bellevue	—15		11
Nevada	Winnemucca	—8	Winnemucca	1	1880	Fort Halleck	—8	1880	13
Do						Camp McGarry	—6		8
New Hampshire	Mount Washington	—19.5	Mount Washington	—31	1874	Dartmouth College	—23		18
Do						Stratford	—22		11
New Jersey	Sandy Hook and Barnegat.	20	Cape May	9	1873	Paterson	0		9
Do			Squan Beach	9	1875	Newark	2		22
New Mexico	Santa Fé	9	Sante Fé	0	1880	Fort Union	—12	1882	31
New York	Oswego	15	Albany	—4	1875	Madison Barracks	—36		56
Do			Malone	—4	1876	Sackett's Harbor	—34		8
North Carolina	Charlotte	30	Kittyhawk	20	1876	Franklin	6	1876	5
Do			Wilmington	20	1873	Fort Johnson	14		58
Ohio	Columbus, Cleveland, & Sandusky.	22	Cleveland	—2	1873	Granville	—14		16
Do						College Hill	—10		64
Oregon	Umatillla	26	Umatilla	12	1880	Camp Harney	—3		6
Do						Fort Klamath	—6	1880	6
Pennsylvania	Erie	21	Erie	2	1877	Pennsville	—14		6
Do			Pittsburgh	2	'73,'77	Carlisle Barracks	—6		37
Rhode Island	Newport	18	Newport	9	1876	Fort Adams	—6		40
South Carolina	Charleston	40	Charleston	25	1873	Fort Moultrie	25		38
Do						Edgefield	20	1876	2
Do						Charleston	31		105
Tennessee	Knoxville	29	Knoxville	6	1873	Glenwood Cottage	11		11
Do						Humboldt	—5	1876	2
Texas	Fort Elliott	18	Fort Elliott	—2	1880	Fort Davis	9		23
Do						Fort Griffin	9	1876	7
Utah	Salt Lake City	11	Salt Lake City	4	1874	Fort Crittenden	—2		8
Do						Coalville	—20	1880	6
Vermont	Burlington	4	Burlington	—4	1873	Randolph	—27		5
Do						Lunenburgh	—23		17
Virginia	Fort Myer	22	Wytheville	—1	1873	Fortress Monroe	13		57
Do						Snowville	9		6
Washington Territory	Spokane Falls	7	Spokane Falls	7	1882	Fort Colville	—20		20
West Virginia	Morgantown	22	Morgantown	0.5	1873	Weston	2	1876	3
Do						Helvetia	4	1877	5
Wisconsin	La Crosse	10	La Crosse	—23	1873	Superior City	—24		8
Do						Fort Crawford	—23		26
Wyoming	Fort Washakie	— 3	Cheyenne	—17	1880	Fort Bridger	—29		20
Do						Fort Sanders	—28	1875	4

Table of maximum and minimum temperatures for March, 1882.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Stations.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Montgomery	86	42	Auburn		33
Arizona	Yuma	95		Maricopa	101	
Do	Prescott		13			
Arkansas	Little Rock	83	39	Mount Ida	84	29
California	Los Angeles	88		Antioch	98	
Do	Campo		15	Summit		— 4
Colorado	West Las Animas	77	6	Pagosa Springs	80	— 8
Do	Pike's Peak	33	—24.5			
Connecticut	New Haven	59	13	Southington		11
Do	New London	59				
Dakota	Yankton	80		Fort Randall	85	
Do	Fort Stevenson		—23	Pembina		—24
Delaware	Delaware Breakwater.	62	28			
District of Columbia	Washington	71	23			
Florida	Jacksonville	88		Fort Barrancas		41
Do	Cedar Keys, Jacksonvile, and Pensacola.		47			
Georgia	Augusta	89				
Do	Atlanta		34			
Idaho	Fort Lapwai	80				
Do	Eagle Rock		—16			
Illinois	Cairo	73		Anna	78	
Do	Springfield			Geneseo and Morrison.		8
Do	Champaign		21			
Indiana	Indianapolis	71	24	Lacona	78	
Do				Spiceland		21
Indian Territory	Fort Supply	85	17			
Iowa	Des Moines	74	10	Logan	78	4
Do	Davenport		10			
Kansas	Dodge City	81	14	Manhattan and Wellington.		12
Kentucky	Louisville	75	31	Bowling Green	79	30
Louisiana	Shreveport	90	41			
Maine	Portland	54		Orono		2.7
Do	Eastport		10			
Maryland	Baltimore	69	26	Cumberland	72	
Do				Deer Park		13
Massachusetts	Boston	61	15	Somerset	63	
Do	Springfield		15	South Lee		3
Michigan	Port Huron	64		Fort Brady		—12
Do	Alpena		0			
Minnesota	Saint Paul	53		New Ulm	61	
Do	Saint Vincent		—25			
Mississippi	Vicksburgh	84	43	Fayette	86	41
Missouri	Saint Louis	79		Protem	86	
Do	Springfield		24	Corning		9
Montana	Forts Custer and Keogh.		76	Fort Shaw		—19
Do	Fort Shaw		—18			
Nebraska	Omaha	77	5	Lincoln	89	
Do				Genoa		2
Nevada	Winnemucca	72	3	Humboldt	82	
Do				Elko		—7
New Hampshire	Mt. Washington	37	—19.5	Auburn	58	10
New Jersey	Atlantic City	66		Freehold		16
Do	Sandy Hook and Barnegat.		20			
New Mexico	La Messilla	87		Fort Union		—12
Do	Santa Fé		9			
New York	New York City	67		Johnstown		2
Do	Oswego		15			
North Carolina	Wilmington	82		Murphy		27
Do	Charlotte		30			
Ohio	Cincinnati	70				
Do	Cleveland		22	Jacksonburgh	72	
Do	Columbus, and Sandusky.			Ruggles and New Athens.		18
Oregon	Umatilla	17	26			
Pennsylvania	Pittsburgh	75		Dyberry		8
Do	Erie		21			
Rhode Island	Newport	57	18			
South Carolina	Charleston	85	40	Stateburgh	89	36
Tennessee	Knoxville	83	29			
Do	Chattanooga	83				

Table of maximum and minimum tempertaures for March, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Texas	Rio Grande	96				
Do	Fort Elliott		18			
Utah	Salt Lake City	68	11	Coalville		0
Vermont	Burlington	54	4	Lunenburgh		— 7
Virginia	Cape Henry	76		Snowville	89	20
Do	Fort Myer		22	Wytheville		20
Washington Territory	Dayton	77				
Do	Spokane Falls		7			
West Virginia	Morgantown	72	22	Helvetia	76	20
Wisconsin	Madison			Beloit	67	
Do	Milwaukee			Ashland		— 2
Do	La Crosse		10			
Wyoming	Fort Washakie	72	— 3	Fort Bridger		—16

PRECIPITATION.

The distribution of rainfall over the United States and Canada for March, 1882, as determined from observations taken at over five hundred stations, is exhibited on Chart III. The table at the left-hand corner of this chart shows the average monthly rainfall, determined from the records of the Signal Service stations in the several districts, and the excess or deficiency of rainfall as compared with the average for many years. Examination of the table shows that there has been a deficiency of rainfall along the Gulf coast, New England, the Middle States, the Missouri Valley, North Pacific Coast region, and at the Rocky Mountain stations. The greatest deficiency occurred on the North Pacific coast, where the monthly rainfall is more than 4.00 inches below the average. A slight excess of rainfall occurred in the Lake region, Tennessee, the Ohio Valley, Upper Mississippi Valley, the extreme Northwest, and the South Atlantic States. A slight excess of rainfall is also reported from California. At the station on Mount Washington an excess of 8.03 inches is reported, while the rainfall in the districts of New England averages about 1.00 inch below the mean for the month. It will be seen from the chart that the area of greatest rainfall extends over the Lower Mississippi, the Tennessee, Cumberland, and Lower Ohio Valleys, where the rainfall for the month has ranged from 6.00 to 10.00 inches.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rainfalls, as published in the lower left-hand corner of Chart III. The following items of importance in connection with this subject are reported by voluntary observers: *Illinois:* Riley, monthly precipitation, 4.58 inches; has been exceeded but twice during past nineteen years, viz., in 1877 and 1881. *Indiana:* Vevay, monthly precipitation, 6.30, or 2.27 inches above the average of past seventeen years. *Iowa:* Clinton, monthly precipitation slightly above the average. *Kansas:* Lawrence, monthly precipitation, 1.62 inches, or 0.62 inch below the average of past fourteen years. The total precipitation for January, February, and March, 1882, is 3.98 inches, or 0.79 inch below the average of the same months for the same period. Yates Center, monthly precipitation, 2.04 inches, or 0.62 above the average of the past two years. Snow fell to a depth of 3¾ inches during the month, which is above the average of past two years. Wellington, monthly rainfall, 0.96, or 0.43 inch below the average of past three years. *Maine:* Gardiner, monthly precipitation, 5.04, or 1.11 inches above the average of past forty-six years. Snowfall for the past winter, 91¾ inches, or slightly above the mean; the smallest winter snowfall, 30½ inches, occurred in 1837–'8; the largest, 146 inches, occurred in 1842–'43. Days of sleighing during the past winter numbered 65; average for forty-six years, 85½; the least number, 16 days, occurred during the winters of 1839–'40 and 1841–'2; the largest number, 136 days, occurred during the winter of 1872–'73. *Maryland:* Fallston, monthly precipitation, 3.28, or 1.30 inches below the average of past eleven years. During that period the largest monthly precipitation, 6.40 and 7.53 inches, occurred in 1871 and 1881, respectively; the smallest, 1.70 inches, occurred in 1874. *Massachusetts:* Worcester, monthly precipitation, 3.32 inches, which is 2.78 inches below that of 1881 and 0.20 inch below the average. The amount of snowfall during the month, 5½ inches, is 10¾ inches below that of March, 1881, and is nearly 5 inches below the average. *Missouri:* Saint Louis, Missouri Weather Service report, monthly precipitation, 3.39 inches, or 0.35 inch below average of past forty-five years. *New Hampshire:* Contoocookville, monthly snowfall, 4 inches, or about 11 inches below the average of past twelve years. *New York:* North Volney, monthly precipitation, 3.12 inches, or 0.15 inch below the average of past nine years. During that period the largest monthly precipitation, 6.97 inches, occurred in 1873; smallest, 2.00 inches, occurred in 1879. *Virginia:* Wytheville, monthly precipitation, 3.16 inches, or 0.14 inch below the average of past eighteen years. *West Virginia:* Helvetia, monthly precipitation, 6.65, or 1.85 inches above the average of the past six years.

Special heavy rains, including melted snow.—1st, Paterson, N. J., 3.63 inches; Lenoir, N. C., 2.80; Ardenia, N. Y., 4.70; Fayetteville, Ark., 3.00; Hatteras, N. C., 3.71; Cedar Keys, Fla., 2.38 in 1 hour and forty minutes; Kittyhawk, N. C., 3.75; Mount Washington, 4.96. 2d, Eastport, Me., 3.18. 5th, Memphis, 3.78. 7th and 8th, Bowling Green, Ky., 2.50 in 16 hours. 8th, Vicksburgh, 2.66. 12th, Forsyth, Ga., 2.38 in 12 hours. 19th, College Hill, Ohio, 4.00. 20th, Cincinnati, 2.54. 26th, Ames, Ia., 2.79; Mount Vernon Barracks, Ala., 4.81, from 7.15 a. m. to 9.30 p. m.; Fort Barrancas, Fla., 2.27 in 1 hour and 30 minutes; Auburn, Ala., 1.58 in 1 hour and 30 minutes. 26th and 27th, Quitman, Ga., 6.83 in 32 hours; Columbia, S. C., 3.59 in 26 hours; Montgomery, Ala., 3.80. 27th, Wilmington, N. C., 4.75, of which 3.31 fell in 8 hours. Augusta, Ga., 4.17, of which 2.70 fell in 8 hours. 27th and 28th, Smithville, N. C., 5.18, of which 2.12 fell in 8 hours; Fayetteville, N. C., 8.25, of which 6.00 fell from 11 a. m. to 10 p. m. 28th, Fort Macon, N. C., 5.71.

Largest monthly rainfalls, including melted snow.—Cisco, Cal., 25.30 inches; Summit, Cal., 19.30; Alta, Cal., 15.40; Mount Washington, 14.52; Fayetteville, N. C., 13.38; Truckee, Nev., 12.00; Forsyth, Ga., 10.46; Boca, Nev., 10.20; Bowling Green, Ky., 9.99; Hatteras, N. C., 9.67; Macon, N. C., and Nashville, 9.36; Auburn, Ala., 9.28; Memphis, 9.10; Austin, Tenn., 8.90; Saint Meinrad, Ind., 8.51; Mount Vernon Barracks, Ala., 8.41; Ashwood, Tenn., 8.15; Smithville, N. C., 7.81; Eastport, 7.54; College Hill, Ohio, 7.50; Vicksburgh, 7.41; Auburn, N. H., 7.25; Morgantown, W. Va., 7.18; Green Springs, Ala., 7.15; Wilmington, N. C., 7.09; Halifax, N. S., 7.06; Ardenia, N. Y., 7.05; Chatham, N. B., 7.00; Colfax, Cal., 6.97; Montgomery, Ala., 6.82; Augusta, Ga., 6.80; Murfreesborough, Tenn., 6.77; New River, N. C., 6.67; Helvetia, W. Va., 6.65; Tennant, Cal., 6.57; Kittyhawk, N. C., 6.49; Murphy, N. C., 6.40; Portsmouth, N. C., 6.35; Sydney, N. S., and Vevay, Ind., 6.30; Little Rock, 6.25; Cincinnati, 6.17; Auburn, Cal., 6.05.

Smallest monthly rainfall, including melted snow.—Benson, Casa Grande, Prescott, Texas Hill, Wilcox, and Yuma, Ariz., Indio, Mammoth Tank, and Mojave, Cal., and Fort Wallace, Kans., none; Laredo, Tex., and Phœnix, Ariz., trace; Key West, Fla., and Fort Verde, Ariz., 0.01; Fort Davis, Tex., 0.03; Kelton, Utah, 0.05; Yankton, Dak., and Cheyenne, Wyo., 0.06; Rapid City, Dak., and Terry's Landing, Mont., 0.07; West Las Animas, Colo., 0.10; De Sota, Nebr., 0.13; Fort Washakie, Wyo., and Punta Rassa, Fla., 0.15; Fort Garland, Colo., 0.16; Foley, Mont., and Fort Collins, Colo., 0.17; Denver, Colo., and White Water, Cal., 0.20; Santa Fé, 0.23; Dodge City, 0.24; Fort Stanton, N. Mex., 0.26; Brook Haven, N. Y., 0.28; Pioche, Nev., Corinne, and Terrace, Utah, 0.30; Helena, Mont., 0.31; Umatilla, Oreg., 0.32; Fort Meade, Dak., 0.33; Olivet, Dak., 0.34; Fort Bridger, Wyo., 0.35; Lordsburgh, N. Mex., and El Paso, Tex., 0.38; Fort McKavett, Tex., 0.39; Tecoma, Nev., Fort Wingate, N. Mex., and Lunenburgh, Vt., 0.40; Fort Keogh, Mont., and La Mesilla, N. Mex., 0.41; Fort Sully, Dak., 0.42; Fort McDermit, Nev., 0.44; Lincoln, Nebr., and Saint Augustine, Fla., 0.45; Deer Lodge, Mont., 0.47; Clay Centre, Kans., and Fort Lewis, Colo., 0.50.

Rainy days.—The number varied in New England from 12 to 23; Middle Atlantic States, 12 to 19; South Atlantic States, 4 to 17; Florida Peninsula, 2 to 6; East Gulf States, 7 to 14; West Gulf States, 11 to 15; Rio Grande Valley, 6 to 11; Ohio Valley and Tennessee, 13 to 20; Lower Lake region, 17 to 24; Upper Lake region, 18 to 25; Extreme Northwest, 13 to 19; Upper Mississippi Valley, 9 to 18; Missouri Valley, 5 to 15; Northern Slope, 2 to 18; Middle Slope, 2 to 10; Southern Slope, 4 to 10; Southern Plateau, 0 to 7; Middle Plateau, 6 to 11; Northern Plateau, 9 to 14; North Pacific Coast region, 17 to 23; Middle Pacific Coast region, 10 to 13; South Pacific coast region, 0 to 10.

Cloudy days.—The number varied in New England from 7 to 11; Middle Atlantic States, 5 to 14; South Atlantic States, 4 to 12; Florida Peninsula, 1 to 3; East Gulf States, 5 to 8; West Gulf States, 5 to 15; Rio Grande Valley, 9 to 16; Ohio Valley and Tennessee, 6 to 15; Lower Lake region, 14 to 18; Upper Lake region, 11 to 18; Extreme Northwest, 8 to 13; Upper Mississippi Valley, 8 to 17; Missouri Valley, 6 to 11; Northern Slope, 1 to 12; Middle Slope, 2 to 5; Southern Slope, 2 to 8; Southern Plateau, 1 to 8; Middle Plateau, 2 to 8; Northern Plateau, 7 to 13; North Pacific Coast region, 14 to 15; Middle Pacific Coast region, 6 to 19; South Pacific Coast region, 1 to 11.

Snow.—The dates on which snow fell in the various districts are as follows: New

England, 1st to 7th, 9th to 14th, 16th to 27th, 29th, 30th, 31st; Middle Atlantic States, 3d, 7th, 9th to 19th, 21st to 26th; Ohio Valley, 10th to 17th, 21st to 24th, 27th; Lower Lake region, 3d, 6th, 7th, 8th to 17th, 21st, 22d, 24th, 25th, 26th, 28th, 30th, 31st; Upper Lake region, 2d, 4th to 18th, 20th to 31st; Extreme Northwest, 1st to 6th, 9th, 13th to 21st, 23d to 29th; Upper Mississippi Valley, 4th to 12th, 14th, 15th, 20th, 21st, 22d, 25th; Missouri Valley, 4th to 12th, 14th, 15th, 16th, 19th, 20th, 21st, 23d, 24th, 26th, 28th, 29th; Northern Slope, 1st to 12th, 14th to 20th, 22d to 26th, 28th, 29th, 30th; Middle Slope, 3d to 10th, 18th, 20th, 26th, 27th; Southern Slope, 5th to 9th; Southern Plateau, 6th, 7th, 8th, 17th, 25th; Middle Plateau, 1st to 10th, 13th to 20th, 22d, 24th, 25th, 26th; Northern Plateau, 2d to 5th, 7th, 8th, 9th, 11th, 13th, 15th to 20th, 25th; North Pacific Coast region, 2d, 3d, 4th, 8th, 14th, 17th, 18th, 19th. Snow was also reported from the following stations not included in the districts named above: Cape Lookout, N. C., 8th; Weldon, N. C., 15th; Fort Gaston, Cal., 19th; San Gorgonia, Cal., 17th; Red Bluff, Cal., 10th.

Particularly heavy or remarkable snowfalls were reported as follows: Geneseo, Ill., 9th, furious snow-storm, the snow attaining a depth of eight inches; Muscatine, Iowa, 9th, one of the severest snow-storms ever experienced; Burlington, Iowa, 9th, heaviest snow-storm of season; depth, ten inches on level; all telegraph wires between this city and Chicago were grounded; no communication East, except *via* Saint Paul; Fort Sully, Dak., 5th, 6th, very heavy snow-storm; travel over wagon roads suspended; trains delayed; Huron, Dak., 20th, very severe snow-storm, accompanied by wind attaining a velocity of 66 miles; snow fell in blinding sheets, making it impossible to see objects twenty feet distant; at 9 a. m. the wind shifted to NW., and increased from 8 to 44 miles in less than fifteen minutes, and afterward increased steadily until 3 p. m., when the maximum velocity was reached; 21st, the storm continued with unabated fury until after sunset, occasioning great inconvenience and suffering to immigrants camping on the prairies; a number of cattle perished from exhaustion and cold; Pike's Peak, Colo., 26th, the most terrible snow-storm of the season began at 11.15 a. m., and continued all day; the instrument-shelter, store-room, and stable were filled with snow to a depth of two feet; the snow penetrated the openings in the roof and ceiling, completely covering the desk, bed, and office floor; 27th, snow drifted about station to depths of from ten to twelve feet.

Largest monthly snowfall.—Cisco, Cal., 251 inches; Summit, Cal., 193; Truckee, Nev., 120.5; Boca, Nev., 102; Alta, Cal., 86; Mount Washington, about 66; Carson City, Nev., 50.4; Colfax, Cal., 44; Eagle Rock, Idaho, 34.5; Duluth, Minn., 27.2; Pike's Peak, Colo., and Wells, Nev., 26.5; Alpena, Mich., Milwaukee, Wis., and Reno, Nev., 25; Moorhead, Minn., 24.6; Grand Haven, Mich., about 24.5; Saint Paul, Minn., 23.8; Battle Mountain, Nev., 21; Port Huron, 20.9; Winnemucca, Nev., 20; Eastport, Me., and Escanaba, Mich., 18; Northport, Mich., 17.3; Beowawe, Nev., 16.5; Palisade, Nev., 16; Blackfeet Agency, Mont., 15.2; Orono, Me., and Newport, Vt., 15; Embarras, Wis., 14.8; Otega, Nev., 14.1; Lunenburgh, Vt., and Golconda, Nev., 13.5; Fort Assinniboine, Mont., 13.2; Franklin, Wis., and Saint Vincent, Minn., 13; Rockford, Ill., 12.8; Erie, Pa., 12.2; Ashland, Wis., Dexter, Me., and Elko, Nev., 12; New Shoreham, R. I., 11.9; Rowe, Mass., 11.5; Riley, Ill., 11.3; Wadsworth, Nev., 11; Muscatine, Iowa, Niles, Mich., and Burlington, Vt., 10.5; Fort Benton, Mont., Carlin, Nev., and Rochester, 10; Lansing, Mich., Minneapolis, Minn., and Browns, Nev., 9.5; Clinton, Iowa, 9.3; Keokuk, 9.2; Lawrence and Holton, Kans., Stafford, Vt., New Ulm, Minn., and Salt Lake City, 9; Corning, Mo., Davenport, Iowa, 8.4; Dyberry, Pa., Auburn, N. H., Geneseo, Ill., Buffalo, and Friendship, N. Y., 8.

Depth of snow on ground at end of month.—*Colorado:* Pike's Peak, 12 inches. *Dakota:* Fort Stevenson, 1 inch. *Maine:* Gardiner, 15 inches; Orano, 2 inches; Portland, trace. *Minnesota:* Saint Vincent, 13 inches; Moorhead, 6 inches. *New Hampshire:* Mount Washington, 41 inches; Auburn, 1 to 2 inches. *New York:* Waterburgh, traces in sheltered places. Friendship and Ithaca, trace. *Pennsylvania:* Dyberry, patches in protected places. *Vermont:* Burlington, trace. *Wisconsin:* trace.

Rain or snow from a cloudless sky.—Baltimore, 22d, 7.15 to 7.25 p. m., light snow from an apparently cloudless sky. Woodstock, Md., 15th, 9.30 p. m., rain from a perfectly cloudless sky.

Hail.—Lynchburgh, Va., 8th, 4.50 p. m., light shower of hail. Charlotte, N. C., 28th, 5.20 p. m., small hail-stones, size of peas. A heavy hail-storm, which did a good deal of damage to wheat, is reported to have occurred at the same time north of the city. Jacksonville, Fla., 1st, small hail. Denison, Tex., 8th, 6.15 p. m., small hail, lasting one minute. Little Rock, Ark., 15th, 1.55 p. m., small hail began falling and was soon followed by a heavy hail-storm; stones measured three-fourths of an inch in diameter and were almost perfectly spherical in form; storm ended at 2.05 p. m.; hail also fell on 27th and 31st. Mason, Tex., 26th, scattering hail of large size fell during thunder-storm. Nashville, Tenn., 17th, 6.37 to 6.40 p. m., hail of considerable size. Cincinnati, Ohio, 27th, 2.30 p. m., hail size of peas, lasting two minutes; 27th, a few large hail-stones fell between 1.20 and 2.10 p. m. Duluth, Minn., 4th, a heavy fall of hail is reported to have occurred at New London, four miles south of station. Keokuk, Iowa, 7th, 8 to 8.10 p. m.; hail-stones three-eighths of an inch in diameter. Omaha, 26th, 1.15 p. m., copious shower of hail, size of peas, lasting three minutes. Springfield, Mo., 12th, 11.30 a. m. to 12.10 p. m.; 15th, 12.10 to 12.45 p. m. Huron, Dak., 4th, hail-stones size of hazelnuts. Colfax, Wash., 3d, heavy hail-storm from 4 to 4.15 p. m. Sacramento, Cal., 17th, 18th, small hail. Roseburgh, Oreg., 2d, 15th, 18th, small hail. Portland, Oreg., 9th, 4.57 p. m., brisk shower of hail lasting ten minutes. Point San José, Cal., 12th, 4 p. m. Alexandria, Dak., 4th. Forsyth, Ga., 27th, slight fall of hail. Vevay, Ind., 18th, 1 to 2 p. m., hail lasting five minutes; stones measuring from one-fourth to one-half inch in diameter; 27th, noon, severest hail-storm ever witnessed in this locality; at 12.07 p. m., stones one-fourth inch in diameter began falling; they rapidly increased in size, varying from one to one and three-fourths inches in diameter, the largest weighing 12 pwts. troy, and were corrugated and lozenge-shaped; many windows were broken and much damage was done to shrubbery and to wheat fields; the duration of the storm was four minutes. Charleston, Ill, 17th, from 11.40 to 11.42 a. m., and from 2.23 to 2.24 p. m., hail-stones the size of common bullets. Swanwick, Ill., 20th. Morrison, Ill., 25th. Fort Wayne, Ind., 7th. Independence, Iowa, 17th, 6 to 8 a. m., severe hail-storm. Cresco, Iowa, 4th, 17th. Guttenburgh, Iowa, 4th, 25th. Nora Springs, Iowa, 4th, 25th. Cedar Rapids, Iowa, 4th, 12th, 25th. Holton, Kans., 26th. Yates Center, Kans., 8th. Gardiner, Me., 10th, 30th. Falston, Md., 21st. Deer Park, Md., 15th. Fall River, Mass, 3d. Kalamazoo, Mich., 4th. Niles, Mich., 5th. Northport, Mich., 2d, 5.30 p. m., hail-storm lasting five minutes, nearly covering the ground with stones as large as buck-shot. New Ulm, Minn., 16th. Corning, Mo., 26th, an excessive rain and hail-storm visited the section of country about 20 miles north of this place. It is reported by the Atchison County papers that hail in some places drifted to depths of three and one-half feet. Only the edge of the storm passed over this place. Protem, Mo., 31st, 3 a. m., heavy hail seven miles southeast of station, doing much injury to fruit trees and gardens. Lincoln, Nebr., 26th. Freehold, N. J., 28th. Princeton, N. J., 9th. Fayetteville, N. C., 1st. Bellefontaine, Ohio, 26th. Bethel, College Hill, Westerville, and Wooster, Ohio, 27th. Jacksonburgh, Ohio, 14th, 18th, 27th. New Athens, Ohio, 27th, 2.30 p. m., hail-storm passed over station in an easterly direction. Twenty miles east of Wheeling, W. Va., considerable damage was done to windows. Dyberry, Pa., 8th, 21st. Wellsborough, Pa., 9th, 18th. Meadville, Pa., 27th. Stateburgh, S. C., 1st. Austin, Tenn., 17th, 28th. Murfreesborough, Tenn., 17th, 26th. Clarksville, Tex., 5th, 8th. Wytheville, Va., 15th. Franklin, Wis., 4th, 17th. Fort Myer, Va., 8th. Castroville, Tex., 22d. Louisville, 27th. Logansport, Ind., 17th. Indianapolis, 15th. Milwaukee, 25th. Alpena, Mich., 15th. Burlington, Iowa, 7th, 8.15 p. m., hail as large as peas, lasting one minute. Des Moines, 14th, 17th. Saint Paul, 4th, 20th. Madison, Wis., 4th. Davenport, Iowa, 17th. Fort Missoula, Mont., 16th, 17th. Deadwood, Dak., 26th. Fort Assinniboine, Mont., 1st. Griffin, Tex., 6th, 8th. Fort Cummings, N. Mex., 25th, 26th. San Carlos, Ariz., 26th. Tucson, Ariz., 25th, 26th. Silver City, N. Mex., 7th. Winnemucca, Nev., 15th. Dayton, Wash., 17th. Umatilla, Oreg., 18th. Colfax, Wash., 3d, 17th, 19th. San Francisco, 15th, 16th, 19th. Des Moines, Iowa, 14th, hail lasting fourteen minutes. Murfreesborough, Tenn., 17th, a severe hail-storm passed over Rutherford and Cannon Counties about 7 a. m. The course of the storm was a little south of east. In some places in Rutherford County hail fell to a depth of eight inches and the stones were unusually large.

Sleet.—The dates on which sleet fell in the various districts are as follows: New England, 1st, 4th, 5th, 6th, 10th, 11th, 18th, 19th, 21st, 26th, 27th; Middle Atlantic States, 8th, 9th, 15th, 17th, 18th, 19th, 21st, 22d, 27th; Ohio Valley, 4th, 10th; Upper Lake region, 2d, 4th to 9th, 14th, 17th, 18th, 20th, 21st, 26th; Upper Mississippi Valley, 8th, 9th, 10th, 13th, 14th, 20th, 23d, 25th; Missouri Valley, 8th, 9th, 12th; Southern Slope, 5th to 9th; Northern Slope, 25th, 26th; Middle Plateau, 6th, 15th, 21st. Sleet was also reported from the following stations not included in the districts named above: Fort Porter, N. Y., 21st; Fort Stevenson, Dak., 14th; Fort Supply, Ind. T., 7th; Umatilla, 18th. Unusually severe storms have been reported as follows: Coleman City, Tex., during sleet-storm on 7th, 8th, ice on telegraph lines accumulated to the thickness of two inches; several iron poles were bent over by the weight and many trees broken. Graham, Tex., 5th to 8th, prostrating telegraph wire. Henrietta, Tex., 7th, ice on telegraph line one and a quarter inches thick; much damage done.

RELATIVE HUMIDITY.

The *mean relative humidity* for the month ranges as follows in the several districts: New England, from 64 to 79; Middle Atlantic States, 58 to 79; South Atlantic States, 61 to 79; Florida Peninsula, 69 to 72; East Gulf States, 66 to 78; West Gulf States, 57 to 83; Rio Grande Valley, 71 to 84; Ohio Valley and Tennessee, 60 to 71; Lower Lake region, 69 to 78; Upper Lake region, 73 to 80; Extreme Northwest, 69 to 90; Upper Mississippi Valley, 62 to 75; Missouri Valley, 60 to 72; Northern Slope, 54 to 69; Middle Slope, 40 to 56; Southern Slope, 41 to 74; Southern Plateau, 36 to 51; Middle Plateau, 50 to 65; Northern Plateau, 60 to 79; North Pacific Coast region, 74 to 78; Middle Pacific Coast region, 62 to 79; South Pacific Coast region, 37 to 72. High stations report the following percentages not corrected for altitude: Cheyenne, Wyo., 41.9; Pike's Peak, 81.0; Santa Fe, 37.3; Mount Washington, 84.6.

WINDS.

The prevailing winds during the month of March at Signal Service stations are shown on Chart II by arrows flying with the wind. On the New England and Middle Atlantic coasts and over Lakes Ontario, Huron, and Michigan the winds are northwesterly; in the South Atlantic States, southwesterly; in the Gulf States, Tennessee, Indian Territory, and northern Texas, southerly; in the Upper Mississippi and Lower Missouri Valleys, northwesterly; in the Plateau regions, variable, but mostly from south to west; in California, westerly to northwesterly; North Pacific Coast region, southerly.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 26,488 miles; Pike's Peak, 19,552; Delaware Breakwater, 14,345; New Shoreham, R. I., 13,887; Portsmouth, N. C., 13,686; Hatteras, N. C., 13,356; Kittyhawk, N. C., 12,840; Sandy Hook, 12,741; Champaign, Ill., 12,433; Sandusky, 12,314; Cape May, N. J., 11,807; Indianola, Tex., 11,616; Barnegat, N. J., 11,532; Huron, Dak., 11,300; Cape Henry, Va., 10,953; Milwaukee, 10,641; Macon, N. C., 10,447; Cheyenne, Wyo., 10,339; Moorhead, Minn., 10,215; Grand Haven, Mich., 10,182; Provincetown, Mass., 10,062; Dodge City, Kans., 10,031; Saint Vincent, Minn., 10,009; Omaha, 10,002; Rochester, 9,938; Fort Shaw, Mont., 9,857; Fort Elliott, Tex., 9,839; Eastport, 9,794; North Platte, 9,495; Boston, 9,425; Fort Myer, Va., 9,258; Davenport, 8,960; Erie and Saint Louis, 8,950; Alpena, Mich., 8,908; Bismarck, Dak., 8,887; Newport, R. I., 8,875; Buffalo, 8,811; Detroit, 8,800; Cleveland, 8,776; Fort Assinniboine, Mont., 8,768; Galveston, 8,668; Springfield, Mo., 8,618; Eagle Rock, Idaho, 8,609; Fort Benton, Mont., 8,429; Columbus, Ohio, 8,250; Port Eads, La., 8,248; Atlantic City, N. J., 8,190; New York city, 8,176; Springfield, Ill., 8,157; Louisville, 8,128; Smithville, N. C., 8,093; Oswego, 8,052; Toledo, 8,019; Fort Buford, Dak., 8,008; Umatilla, Oreg., 8,002. The smallest are: Roseburgh, Oreg., 2,279; Uvalde, Tex., 2,732; La Mesilla, N. Mex., 2,757; Phœnix, Ariz., 2,848.

High Winds.—On the summit of Mount Washington the maximum velocity, 118 miles, NW., occurred on the 24th. Velocities of 75 miles per hour or over occurred as follows: 114 miles, S., 1st; 91, NW., 4th; 100, SW., 9th; 108, NW., 20th; 90, NW., 21st; 118, NW., 24th; 75, NW., 25th; 93, SW., 27th; 92, SW., 28th; 90, NW., 31st. On all other dates during the month velocities reached or exceeded 50 miles per hour, with the exception of 5th, 12th, 15th, 16th, 17th, 22d. On the summit of Pike's Peak, Colo., the maximum velocity, 92 miles, N., occurred on 20th. Other high velocities occurred as follows: 60, NW., 1st; 60, SW., 3d; 58, SW., 4th; 58, SW., 10th; 56, SW., 11th; 58, SW., 16th; 60, SW., 17th; 50, SW., 19th; 78, N., 21st; 62, SW., 25th; 62, NW., 28th; 66, NW., 29th. Other stations reporting velocities of 50 miles per hour or over are as follows: Umatilla, Oreg., 52, W., 28th; Fort Assinniboine, Mont., 56, W., 28th; Fort Benton, Mont., 50, W., 1st; Fort Shaw, Mont., 51, SW., 27th, and 57, SW., 28th; Helena, Mont., 56, SW., 28th; Fort Custer, Mont., 64, W., 28th; Fort Keogh, Mont., 50, W., 28th; Cheyenne, Wyo., 52, NW., 28th; Fort Washakie, Wyo., 60, W., 28th; Huron, Dak., 50, NW., 5th, and 66, NW., 20th; Palestine, Tex., 60, S., 18th; Indianola, Tex., 53, N., 21st; Rochester, N. Y., 50, N., 21st; Columbus, Ohio, 54, W., 21st; Champaign, Ill., 50, SW., 9th; Delaware Breakwater, Del., 52, SE., 1st; Cape Henry, Va., 52, NW., 13th; Kittyhawk, N. C., 50, N., 24th.

Local storms.—Savannah, Ga., 28th, during the morning a tornado passed through the counties of Effingham, Washington, Bibb, and Randolph, of this State. Its track was about half a mile wide, and it passed from west to east. Several lives were lost; trees, fences, houses, and telegraph poles were blown down. Columbus, Ohio, 21st, severest storm experienced for years passed over city at 5 a. m. The wind continued to blow a gale all day; maximum velocity, 54 miles, W., was reached at 5.15 p. m. A large number of buildings in course of construction were damaged; outhouses, fences, signs, etc., were blown down. Cleveland, 9th, 8.35 p. m., during a severe storm Saint Mary's Catholic Church was unroofed; a store on Broadway had its front blown in and considerable other damage of minor nature was done in the city; 27th, severe storm; between 12.30 and 1 p. m. rain fell in torrents. A new frame building was blown over and crushed; another was moved two feet from its foundation; a frame store was also blown down; trees were uprooted, windows broken, and lumber piles were scattered. A high wall, the ruins of a recently burned building, was blown down, crushing through the roof of the adjoining building to the cellar and completely wrecking it. Sandusky, 27th, 9 p. m., heavy inky clouds came up from northwest, accompanied by lightning and thunder. As the storm approached it moved around to the northward and apparently only the edge of it touched the city. At Kelly's Island much damage was done to a building in course of construction. Buffalo, 27th, severe storm reported from localities south of station; considerable damage was done. Saint Louis, 21st, one of the fiercest gales that has ever visited this city; the wind blew in violent puffs; maximum velocity, 42 miles; very little damage was done. Springfield, Ill., 21st, strong gale; a house in course of construction and nearly completed was entirely demolished; a few others were unroofed and many others were blown down. Omaha, 20th, severe gale; several signs were torn from their fastenings; a wagon was upset in the street. Fort Washakie, Wyo., 28th, very severe gale; fences, outhouses, etc., were blown down; some new stables had roofs blown off; the Signal Service instrument shelter was badly damaged. This storm is considered by the inhabitants to have been the severest experienced for many years. Fort Custer, Mont., 28th, gale from the west; maximum velocity, 64 miles at 4.15 p. m.; the sky was completely obscured by clouds of dust and pebbles; the west end of the post hospital was demolished and carried fifty yards; the porch of the barracks was thrown by the wind on the roof of the building; outhouses were overturned and fences blown down. Saint Meinrad, Ind., 27th, violent gale; many forest and fruit-trees blown down. Fort Wayne, Ind., 20th, 10.30 to 11.30 p. m., severe storm; buildings, fences, etc., blown down. Saint Louis, Missouri Weather Service reports: At 3 p. m. on the 26th a small tornado formed a short distance southwest of Hamansville, Polk County, and passed north of east through Elkton, Hickory County. Several houses were destroyed; no lives were lost, but in some cases severe injuries were inflicted. New Haven, Conn., 4th, strong gale; trees, fences, and signs blown down. Monroe, La., 26th, violent hurricane, doing much damage; several gin-houses and cabins were destroyed; damage estimated at $25,000; several negroes reported killed.

Reports from counties in southern Alabama and Georgia show that a violent and destructive tornado occurred in that section on the night of the 27th. In Butler County, Ala., some fifteen or twenty residences were either unroofed or entirely destroyed; a number of persons were more or less injured. The tornado passed through the upper part of Henry County between 9 and 10 o'clock. A farmer living in the track of the storm was instantly killed by the falling timbers of his house, and his wife seriously, if not fatally, injured. On this and other farms westward there was a total destruction of all the dwellings, gin-houses, and engine-works. In Dallas County the storm was especially destructive. In a small place called Liberty Hill every building is reported to have been destroyed and a number of persons killed. On plantations lying east, south, and west of Selma houses were blown to pieces, trees uprooted, fences blown down, and general destruction was caused by the terrific force of the wind. In East Selma a number of large buildings were demolished. In Black Creek bottom numerous trees were broken, their trunks being carried many feet and the boughs taken up and deposited in fields hundreds of yards distant. In the East Selma cemeteries great damage was done to the monuments and shade trees; shrubbery and fences were laid low. In Barbour County, Ala., the track of the tornado was about a mile in width. It literally swept everything before it—trees, fences, and houses—leaving them in utter ruin. In this county one man was killed and several were seriously injured. On one farm every house was blown away; on another all the buildings with the exception of the residence were destroyed. Many other farms suffered to a greater or less extent. A Methodist church at White Pond was torn to pieces; even the sills upon which it stood were removed. In Richards's settlement several lives were lost and many persons were injured. The baggage and passenger cars on the Clayton Railroad were thrown from the track and wrecked. The southwestern part of Lee County suffered considerable damage; many residences were completely destroyed, several lives were lost, and many persons were injured more or less seriously; one man was instantly killed. The tornado crossed the track of the Southwestern Railroad within three-quarters of a mile of the town of Smithville, Ga. In this vicinity hundreds of tall and massive pines were uprooted, and fences in the neighborhood were leveled. On a plantation three cabins were entirely demolished, while a fourth, distant about one hundred yards, remained intact. The dwelling on this place, a strongly-built two-story frame structure, had the part facing the east, together with attached sheds, entirely demolished, while the front, though severely wrenched, remained standing. The owner of this dwelling states that he noticed a great stillness and warmth in the atmosphere at 11 p. m. About half an hour later he heard a roaring, rushing sound, similar to that of several trains passing at full speed. In a few minutes vivid flashes of lightning followed each other in rapid succession; then large hailstones began to fall; the roar increased; the house began swaying and in a few moments came down with a crash. The occupants narrowly escaped with their lives to a cabin about a hundred yards distant. At this time rain was falling in torrents, accompanied by such rapid flashes of lightning as to be almost continuous. The stock of the plantation was dispersed. A strong log-hut about twenty yards northward of the dwelling was crushed, while a light frame structure about fifteen yards southeast was not harmed. A colored man on a neighboring plantation was killed by lightning. At this point the track of the tornado was about half a mile wide, and its course a little north of east. Most of the trees blown down on the southern edge lay about southeast and northwest, their tops pointing to the southeast; on the northern edge some were noticed to lay with tops to north and northwest, and others just the reverse. It was also noticed that in some places the trees were twisted off and uprooted, pointing in every direction, some apparently sucked in, others blown outward. One observer claims to have witnessed the funnel shape of the roaring mass, and states that, by the aid of the incessant lightning, tree-tops, planks, and *débris* could be seen whirling around at a great height; in places some tall trees within a short space of the immediate track had only their tops taken off, while in others trees were torn up by the roots. The path of the tornado clearly showed the bounding nature of the whirling mass, and that it did not cling closely to the earth. Right in the track a clump of trees, a line of fence, or a house, would remain untouched, while to the east or west everything would be swept clean. In some places an upward and downward curve could be detected in its course; here a mass of trees were leveled to the ground, and there a cluster with only their tops broken off. Reports from Bulloch County show the tornado to have passed over a portion of that county, sweeping nearly everything in its path. At Sandersville, Ga., on the 27th, a tornado passed over the county about 11 a. m., causing much destruction. A number of persons were seriously injured by the blowing down of houses. A school-house, at Whidden settlement, was blown down, the teacher and several children were injured. With the exception of the destruction of some fencing and shade trees, Sandersville escaped. At Raynesborough, Ga., 27th, a destructive wind swept over the county, four or five miles northeast of this place. Within the path of this storm a house was blown to pieces, killing one child. No other personal injury is reported, although houses are said to have been destroyed on every plantation within its course. All the public roads are seriously obstructed by fallen trees. Macon, Ga., 27th, a tornado did considerable damage to property near here, and along the railroad as far as Sandersville, dwellings, barns, gin-houses, cabins, and trees were destroyed. No fatal accidents are reported. The tornado was very violent and its track was about a thousand yards wide; it moved from west to east.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for March, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 86.66 per cent. The percentages for the four elements are: Weather, 81.91; Direction of the Wind, 83.33; Temperature, 90.46; Barometer, 90.86 per cent. By geographical districts they are; For New England, 86.56; Middle Atlantic States, 89.89; South Atlantic States, 86.36; East Gulf States, 83.77; West Gulf States, 81.92; Lower Lake region, 89.06; Upper Lake region, 88.59; Tennessee and the Ohio Valley, 91.36; Upper Mississippi Valley, 86.43; Lower Missouri Valley, 80.48; Northern Pacific Coast region, 81.94; Middle Pacific Coast region, 93.14; Southern Pacific Coast region, 93.14.

There were 88 omissions to predict (31 being due to the absence of reports from the Pacific coast) out of 3,813, or 2.30 per cent. Of the 3,725 predictions that have been made, 143, or 3.84 per cent., are considered to have entirely failed; 148, or 3.98 per cent., were one-fourth verified; 395, or 10.60 per cent., were one-half verified; 207, or 5.56 per cent., were three-fourths verified; 2,832, or 76.02 per cent., were fully justified, so far as can be ascertained by the tri-daily reports.

Cautionary signals.—One hundred and seventy-four cautionary signals were displayed during the month of March, of which 162, or 93 per cent., were justified by winds of twenty-five miles per hour, at, or within, 100 miles of the station. Sixty-four off-shore signals were displayed, of which 55, or 86 per cent., were fully justified; 58, or 90 per cent., were justified as to direction; and 61, or 95 per cent., were justified as to velocity. Two hundred and thirty-eight signals of all kinds were displayed, of which 217, or 92 per cent., were justified. Twenty-five cautionary signals were changed to off-shore signals. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only. Twenty-nine signals were reported late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand of Chart III are given the highest and lowest stages of water, as observed at Signal Service stations, during the month of March. At stations on the Mississippi it will be seen that the water remains above the danger-line at Cairo and Vicksburgh, and is only four inches below the danger-line at Memphis. The readings of the highest water during the month at stations on the Lower Mississippi were as follows: Cairo, 51 feet; on the 1st, or 11 feet above the danger-line. Memphis, 36 feet, on the 6th, 7th, 9th. Vicksburgh, 48 feet 9 inches on 20th, or 8 feet 9 inches above the danger-line. The highest at New Orleans occurred on the 27th, when it was but 5 inches below the high-water mark of 1874. The Red River was highest at Shreveport on the 10th, 11th, 12th, when it was 31 feet 1 inch, or 1 foot above the danger line; it was the lowest on the 31st. The Ohio River rose during the latter part of the month, but did not reach the danger-line; it was highest at Cincinnati on the 25th, at Louisville on the 26th, at Pittsburgh on the 22d. The Cumberland was highest at Nashville on the 11th and 13th, when it was 3 feet 9 inches above the danger-line. The Upper Mississippi rose slowly during the month, between La Crosse and Saint Louis, and was highest at Keokuk and Davenport on the 31st.

Ice in rivers and harbors.—*Hudson River:* Albany, 1st, ice broke up in river; 3d, river free of ice. First steamer of season left this city for New Baltimore, to-day; 5th, river free of ice from Troy to New York; navigation practically open for this season; 10th, first arrival by river from New York. New York City, 9th, navigation opened; first steamer from Troy arrived to-day. *Mohawk River:* Albany, 1st, ice broke up in river and passed this city this evening. *Connecticut River:* Springfield, Mass., 2d, floating ice in river. 3d, river clear of ice. *Genesee River:* Rochester, 28th, first boat of season arrived to-day. *Detroit River:* Detroit, 2d, ice along shore in river; 13th, steamer City of Detroit left for Cleveland; first departure of season. *Lake Erie:* Buffalo, 26th, the propeller New York, arrived from Cleveland; the earliest arrival for many years. *Saint Lawrence River:* Cape Vincent, N. Y., 3d, ice breaking up and going out of river and lake at this place. *Lake Superior:* Marquette, 3d, ice moved out of harbor; 4th, ice moved back into harbor; Duluth, Minn., 1st, all ice went out into the lake during the night; 4th, ice driven back during the evening; 5th, lake filled with ice; 10th, ice moved out about one-fourth mile; 18th, ice moved out about one-half mile; navigation resumed; tugs with freight and passengers left for northern ports; 20th, ice driven back again, damaging the old breakwater. *Lake Michigan:* Milwaukee, 8th, navigation practically open. Northport, 31st, no ice to be seen in lake; navigation fairly open. *Manitowoc River:* Manitowoc, Wis., 4th, ice broke in river; 7th, river frozen; 15th, river open. *Lake Huron:* Alpena, 2d, ice broken in bay and river; navigation open. Port Huron, 23d, steamer Flora left city this a. m. for northern ports; the earliest departure for years. *Yellowstone River:* Fort Buford, Dak., 29th, ice broke in river at 10 p. m. Fort Keogh, Mont., 28th, river open. Terry's Landing, 25th, river open; 26th, ice gorged in shallow places. Foley, Mont., 28th, ice broke in river during night. Iron Butte, 29th, ice broke in Upper Yellowstone to-day, sweeping out about 100 feet of Northern Pacific dike. *Mississippi River:* Burlington, 4th, navigation opened; first boat of season passed city at 5.45 p. m.; 11th, first passenger steamer from Saint Louis touched this city on her upward trip to La Crosse. Keokuk, 6th, navigation open; first raft of season passed to-day; 18th, first northward bound steamer passed to-day. La Crosse, 3d, river opened; 4th, navigation resumed; steamer arrived from Fountain City; ferry-boats making regular trips. Saint Paul, 9th, ice broken in places; 23d, ice breaking up in river and moving down stream; 24th, ice gorge in river; 26th, ice gorge at 6.30 p. m.; 27th, 29th, river full of floating ice. *Missouri River:* Yankton, 4th, ice broke in river; 8th, river frozen; 17th, ice broke in river. Leavenworth, 9th to 12th, slush ice in river; 13th, river clear of ice; 26th, steamer Red Cloud from Saint Louis to Fort Benton passed to-day. *Tongue River:* Fort Keogh, Mont., 25th, ice broke in river. *Powder River:* Foley, Mont., 24th, ice broke in river at 8 a. m. *Cobossee River:* Gardiner, Me., 28th, a. m., ice started from mouth of river above the bridge. 29th, river clear of ice to cove 1½ miles below the bridge.

Floods.—The excessive rainfall in the central Mississippi and Ohio Valleys and in Tennessee, during the month, has caused a continuation of the damaging floods, especially in the Mississippi Valley south of Cairo. At this station the water was 51 feet on the gauge on March 1st. This is 11 feet above the danger line. The observer at that station reports that the Mississippi and Ohio remained above the level in places until March 2d. After that they began to recede from the top of the city's embankments. An overflow was prevented only by the construction of a bulkhead on the top of the levee, and extending it around the city. This bulkhead was constructed by driving short stakes into the earth at intervals of 6 feet, and nailing planks to the uprights. Against this an embankment of earth was thrown on the side from the river. The sipe-water referred to in February report continued to rise until the 22d, when it reached its maximum, the highest ever known, almost the whole city being under water. On the 27th of March the water had fallen to 41 feet and 1 inch on the gauge, and was low enough to permit of the opening of the sewers. The damage done in the inundated region is much greater than was at first estimated. All railroads leading from the city were under water; passengers leaving the city were compelled to take passage in boats in order to reach the trains. About four thousand sufferers in Alexandria and Pulaski Counties have received rations issued by the Government. The observer at Memphis reports, on the 6th, the river is 36 feet above low water of 1872, which is the highest on record; 7th and 9th, river 36 feet; 10th, river falling slowly. Reports indicate that the present flood in the Lower Mississippi is more extensive and destructive than the floods of 1862, '67, and '74. The river ranges from 10 to 20 miles in width from Cairo southward to New Orleans; but the region of greatest damage lies between Vicksburgh and Memphis. The observer at Vicksburgh reports: 12th, river rising; levee on Louisiana side of river opposite station and protecting Delta, La., is in imminent danger of being broken; 13th, river rising; much distress reported from Yazoo and Sunflower Valleys above station; entire country overflowed; 14th, river very high; lower Levee street under water; refugees from overflowed districts arriving in city; 15th, river still rising; levee on opposite side of river gone; break 150 yards wide; a few houses were swept away. The river reached its maximum height, 48 feet 9 inches, on the 20th; 21st, river falling. Reports from White River, Clarendon, Ark., state that the back water from the Mississippi extends to a distance of a hundred and thirty-five miles, and that the entire country intervening is under water. The river is 2 feet higher than was ever known before. The river reached its highest point at New Orleans on the 27th, when it was 5 inches below the high-water mark of 1874.

The overflow in Concordia Parish extends from the Black to the Mississippi River, a distance of 35 miles; in Tensas Parish, from Tensas River and Bayou Macon to the Mississippi River, a distance of 30 miles; in Franklin Parish, from Tensas west to the Ouachita River, a distance of 10 miles; in Madison Parish from Bayou Macon to the Mississippi River, a distance of 35 miles; in East Carroll Parish from Bayou Macon to the Mississippi River, 10 miles. The flood extends to the Ouachita River, a distance of 15 miles. The Tensas River, since Saturday, has risen 5 feet, and is still rising at the rate of 11 inches in twenty-four hours. Along the Tensas and Bayou Macon the water is 3 feet higher than in 1875, and the unprecedented flow is accounted for by the breaks in the levees at Milliken's Bend and Goodrich Landing. Natchez, Miss., 24th, reports from the Tensas River and its tributaries are more distressing every day. The water is two and a half feet higher than in 1874, and is rising at the rate of five inches in twenty-four hours. Reports from Yazoo City, 15th, state that the water rose in the river six and a half inches in the past twenty-four hours, while the back water is rising more rapidly. The current of the Yazoo is running up stream to Satartia, twenty-four miles below here. Greenwood, 200 miles above here, is covered with water, and the last boat brought the news that the citizens, white and black, were taking refuge on the second floor of the court-house. Greenwood was not covered by the overflow of 1867. Reports from Fort Adams, Miss., 15th, state that there has been for several weeks a continued rise of the river at this point, of from three to four inches every twenty-four hours, up to Sunday, the 12th instant, when it reached the high-water mark of 1874. Since then the rise has been partially checked, being only one inch in the last twenty-four hours. The river is now about four inches above the high water-mark of 1874. The prospects for crops in the hills are not as promising as they might be. Work is very backward, owing to the continued rains. Farmers have had but very little good weather to prepare for planting, and the general outlook is rather gloomy. A dispatch from Yazoo City on the 18th makes the startling announcement that the water at that point is higher now than in 1867. Following the course of the river the distance from Vicksburgh to Coldwater is about four hundred and fifty miles. The entire country contiguous is swamp lands. In width it is probably sixty miles, and this is known as the Yazoo Delta, which is bounded on the east by the hills and on the west by the Mississippi River. The lowlands are entirely submerged, with the exception of a few knolls or Indian mounds at long intervals, on which the stock and people are gathered where they are accessible.

The rains, together with the unusual volume of water from the Mississippi River flowing through the breaks into the tributary streams, the principal of which are the Coldwater, Tallahatchie, Yazoo, Sunflower, Big and Little Deer Creeks, and many others of less note, have caused them to be swollen beyond precedent. In the mean time the people are totally unprepared to protect themselves or property; hence the losses are simply beyond estimate. Loss of life has not been large, but the loss of cattle and stock and provisions, agricultural implements pertaining to culture of cotton, has been great beyond comparison. Reports from Helena, Ark., on the 18th, state that the destitution now prevailing in the sunken lands of the upper Saint Francis was never equaled. The Tyronga, a small river running out of the Saint Francis, with Little River and other points, are thickly settled with whites, who are on rafts, scaffolds, and logs. Families are huddled together like animals, praying for food. For a distance of three hundred miles no land is to be seen. The river continues falling at Helena, but the overflow in the city remains about the same. Captain Gordon Webster, of Indian Bay, Ark., one hundred miles up White River, arrived at Memphis on the 7th, and reports as follows: The water there is 35 inches higher than ever before; this is attributed to the backwater from Helena, a large volume of which rushes across the low country and assists in filling the whole intervening swamps. Indian Bay is deserted by all except one family, who are encamped on Indian mounds, others having sought quarters on the bluffs of Saint Charles or adjacent hills. More than half of the stock belonging to the people of Monroe County has been lost, and from five to six hundred residents are destitute and need immediate assistance. Several fields of recently planted corn are covered with from nine to twelve feet of water. Reports received from Lake Providence, La., 25th, state that the break in the levee at Alsalia, below Lake Providence, widens; there are three breaks between Alsalia and Goodrich's Landing, and four between Goodrich's and the Raleigh Place. The breaks are from 100 to 800 yards wide, and increasing. The country from Melbourne down is all under water to depths from six to eight feet; it extends back for miles. There has been an immense loss of stock and household goods. No attention was paid to saving property when the break occurred, as it was a matter of life and death. It required every effort to save human life. The whole day is being spent in rescuing people. Many are in danger for want of boats to rescue them. Several children and men were drowned. The loss of life and property cannot be ascertained. Helena, Ark., 25th, river fell two inches to-day and the overflow in the city is about the same. Lieutenants Satterlee and Richards, detailed by the Secretary of War to examine into the condition of affairs here, report much destruction below and in the interior. The Ohio River reached its highest point at Cincinnati on 25th, when it was three feet below the danger-line or forty-seven feet on the gauge. The observer at Cincinnati, on the 20th, reports very heavy rains, causing rivers and streams to rise suddenly. Several coal barges broke from their moorings and a number of small bridges were carried away. The Cumberland River, at Nashville, was 45 feet 9 inches on the gauge from the 11th to 13th, or 3 feet 9 inches above the danger-line. The observer at that station reports on the 6th, river rose 14 feet 4 inches in twenty-four hours; 9th, river rose 6 feet 4 inches in twenty-four hours, and is 7 inches above the danger-line; no damage reported; 10th, river 3 feet 5 inches above the danger line. The river continued at this point above the danger-line until after the 15th. The heavy rains in northern Alabama, between the 6th and 10th, caused the Tennessee to overflow its banks near Chattanooga, resulting in considerable damage to railroad embankments. The Red River, at Shreveport, was highest on the 10th, 11th, and 12th, where it was 31 feet 1 inch on the gauge, or one foot four inches above the danger line.

High tides.—Boston, 19th; New Shoreham, R. I., 18th; Delaware Breakwater, 19th; Little Egg Harbor, N. J., 17th, 18th; Flushing, N. Y., 16th.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations with the average depth at which the observations were taken, is given in the table on the right hand of Chart II. Observations on temperature of water were not taken on the following dates and at the following stations on account of ice in harbors: Milwaukee, 1st to 6th; Detroit, 2d; Duluth, 5th to 31st; Alpena, 1st; Marquette, 1st, 2d, 4th to 31st; Escanaba, frozen throughout the month; Burlington, Vt., lake frozen throughout the month. It will be seen that the mean of the maximum and minimum temperatures of water correspond very nearly with the temperature of the air at the stations, as indicated by the isothermal lines on Chart II.

ATMOSPHERIC ELECTRICITY.

Auroras.—The most widely observed display occurred on the 19th. This remarkable display was observed by stations along the northern boundary of the United States, from Eastport to Oregon, and was reported by the various stations as follows: Eastport, Me., 10.30 p. m. to midnight, faint light in northern sky, extending from northwest to northeast, and to an altitude of 20°; Gardiner, Me., 10.30 p. m. to 3.45 a. m. of 20th, very bright, with beams moving rapidly from east to west; Burlington, Vt., 10 to 11.45 p. m., very brilliant with dark segement low down upon the horizon, bright arch, streamers shooting up to a height of from 20° to 45°, and of greenish color; Boston, 9.30 p. m. to 4 a. m., of 20th, faint auroral band along the horizon, extending 60° azimuth. At 2 a. m. it became very brilliant, with streamers shooting up to an altitude of 30°, and moving slowly along the horizon from west to east; Springfield, 11.18 p. m., very faint, consisting of a slight glow and a few faint rays attaining an altitude of 10°. At 2 a. m. it was somewhat brighter, with an occasional faint ray; Albany, 20th, 12.10 a. m., pale yellow auroral light in northern sky; streamers observed at 12.25 and 2.10 a. m.; the sky, bordering the upper limit, was intensely dark; no dark segment beneath; still visible at 3.45 a. m. Harvard College, Cambridge, Mass., first noticed at 9.15 p. m. as a low, faint arch, streamers appeared soon after and were still visible at 11 p. m. Point Judith, R. I., 8 a. m. to midnight, faint auroral light in northern sky. Fall River, Mass., 10 p. m., aurora mainly in the northwest with a few streamers about 30° in length. Rowe, Mass., 10.30 p. m.; North Volney, N. Y., 9.15 p. m., faint auroral light in northern sky. Ithaca, N. Y., first observed at 9 p. m. as a broad arch of light on northern horizon; at 10 p. m., beams extended upward to a height of 20° and soon disappeared; very faint at 11 p. m. Newport, Vt., during evening. Palermo, N. Y., very bright during evening. Rochester, N. Y., first observed at 9.30 p. m.; maximum brilliancy at 11.45 p. m.; arch of pale yellow 20° in height with an unusually low dark segment; disappeared at daybreak on the morning of 20th. Madison Barracks, N. Y., during evening. Oswego, 19th, 9.45 p. m. to 2 a. m. of 20th, consisting of dark segment surmounted by a diffuse light extending half way to the zenith; very bright at 1 a. m., in northeast with beams extending upward to an altitude of 80°. Alpena, Mich., 9.15 to 11.35 p. m., consisting of a diffused light with a few small streamers. Marquette, Mich., 8.20 p. m., aurora of pale yellow color, with beams having a quick lateral motion reaching an altitude of 45°; disappeared at 10 p. m. Northport, Mich., 8 to 10.30 p. m., extending from northwest to northeast with an arch about 30° in height and bright beams 40° in height. Fort Brady, Mich., 8 p. m., fine auroral display. Northfield, Minn., from dark until 7.30 p. m. Terry's Landing, Mont., during evening. Umatilla, Oreg., 8.55 to 10 p. m., presented a very bright and luminous appearance, but was partially obscured by clouds. Dayton, Wash., from 9.10 to 9.35 p. m., when display was obscured by clouds; it consisted of a pale white light. The next in importance was the display of the 8th, which was reported by numerous stations from Eastport, Me., westward to Bismarck, Dak., and southward to Fort Myer, Va. At many of the stations reporting, the displays were very brilliant and in some instances continued from early evening until the morning of the 9th. Displays of less importance occurred on the 10th, 14th, 15th, 18th, and 20th. At Burlington, Vt., a faint aurora was observed from 10 to 11.45 p. m. of the 4th; at Manitowoc, Wis., from 8 to 8.30 p. m. aurora with beams in northwestern sky; and at Ruggles, Ohio, on the 30th.

Atmospheric electricity interfering with telegraphic communication.—Castroville, Tex., 6th, 7.32 p. m., a flash of lightning damaged the lightning arrester by burning the points. The report of thunder, which was very heavy, was preceded by a sound resembling the discharge of a pistol. Bismarck, Dak., 19th. Rapid City, Dak., 4th, atmosphere so charged with electricity as to necessitate the cutting out of instruments. Fort Sully, Dak., 5th. Deadwood, Dak., 4th, a severe electric storm raged among the hills and no the plains. At times an electric charge would enter the office and appear as large luminous balls on the switch-board binding-screws. About 4.30 p. m., while the line was uninterrupted and working well, a peculiar hissing noise was audible for a few seconds, followed immediately by a loud crash, when the entire switch-board was enveloped in flames. No damage was done to the instrument, but the insulation in the "cut-out" was consumed; 5th, the electric charges entered the office several times during the day, exhibiting the same peculiarities as on the 4th. Jacksborough, Tex., 25th. Stockton, Tex., 15th, 16th, 24th. Fort Quitman, Tex., 24th, 25th, during thunder-storms, compelled to cut out instruments. Dayton, Wash., 16th, 5 p. m., during rain-storm, the telegraph wires were so powerfully charged with electricity from a passing cloud that the line could be worked between Dayton and Pomeroy without the aid of a battery. Umatilla, Oreg., 28th, air so charged with electricity that a shock could be felt by touching the stone pipe on telegraph wire. Fort Yates, Dak., 4th, electric storm.

Thunder-storms.—There were reported in the various districts on the following dates: *Middle Atlantic States:* 12th, 15th, 18th, 20th, 27th. *South Atlantic States:* 1st, 6th, 10th, 12th, 15th, 16th, 27th, 28th. *Florida Peninsula:* 1st. *East Gulf States:* 6th to 9th, 12th, 15th, 16th, 18th, 21st, 26th, 27th. *West Gulf States:* 4th, 5th, 8th, 12th, 15th to 20th, 26th, 27th, 29th, 31st. *Rio Grande Valley:* 6th, 7th, 20th. *Ohio Valley and Tennessee:* 3d to 6th, 9th, 11th, 14th to 21st, 23d, 25th to 29th. *Lower Lake region:* 15th, 18th, 27th, 29th, 30th. *Upper Lake region:* 4th, 5th, 7th, 17th, 18th, 20th, 25th, 26th, 29th. *Upper Mississippi Valley:* 3d, 4th, 5th, 9th, 11th, 12th, 14th, 16th to 25th, 26th, 27th. *Missouri Valley:* 3d, 4th, 5th, 7th, 8th, 9th, 11th to 15th, 17th to 20th, 24th to 27th, 31st. *Middle Slope:* 23d, 25th, 26th, 27th. *Southern Slope:* 5th to 8th, 15th, 16th, 18th, 19th, 20th, 24th, 25th. *Southern Plateau:* 24th, 25th. *Middle Pacific Coast region:* 15th, 16th. They were also reported from the following stations, not included in the above districts: Saint Vincent, Minn., 17th; Fort Sisseton, Dak., 4th; Deadwood, Dak., 4th, 5th; Dayton, Wash., 1st; San Buenaventura, Cal., 13th.

During thunder-storms the following instances of damage by lightning occurred: Springfield, Ill., 27th, cow killed by lightning. San Francisco., Cal., 15th, as the pilot-boat Lady Mine was proceeding to sea, and had reached the bar, she was struck by lightning, and her maintop-mast and mainmast-head, were shivered. This is the first case on record of damage by lightning to a vessel in or near this port. Charleston, Ill., 17th, a hickory tree was struck and shattered. At the fair grounds, one mile west of Court House, a two-year old child was knocked insensible. Cresco, Iowa, 17th, barn struck by lightning, killing two horses and one cow.

OPTICAL PHENOMENA.

Solar halos.—Solar halos have been observed in the various districts on the following dates: New England, 2d, 5th, 9th, 11th, 15th, 18th, 20th, 26th, 28th, 29th; Middle Atlantic States, 5th, 6th, 7th, 8th, 12th, 15th, 18th, 29th, 31st; South Atlantic States, 9th, 10th, 11th, 17th, 26th; Florida Peninsula, 25th, 29th; East Gulf States, 3d, 17th, 19th, 22d, 24th, 25th; West Gulf States, 4th, 11th, 24th; Ohio Valley and Tennessee, 2d, 3d, 4th, 6th, 7th, 8th, 11th to 14th, 17th, 18th, 19th, 23d, 24th, 26th, 27th to 31st; Lower Lake region, 5th, 7th, 8th, 9th, 11th, 14th, 15th, 17th, 20th, 25th, 29th, 31st; Upper Lake region, 1st, 4th, 11th, 14th, 19th, 28th, 29th; Upper Mississippi Valley, 1st, 2d, 4th to 7th, 10th, 11th, 12th, 14th, 18th, 19th, 20th, 23d, 24th, 25th, 27th, 28th, 29th, 30th; Missouri Valley, 1st, 5th to 9th, 11th, 13th, 20th, 23d, 24th, 29th; Middle Slope, 4th, 6th, 14th, 15th, 16th, 20th, 27th, 28th, 29th; Northern Plateau, 12th, 17th, 20th, 22d, 23d, 25th, 29th; Middle Plateau, 10th, 22d, 24th, 28th; Middle Pacific Coast region, 6th, 12th, 22d to 26th, 28th; South Pacific Coast region, 10th, 16th, 18th, 28th. They were also reported from the following stations, not included in the districts named above: Saint Vincent, Minn., 30th; Helena, Mont., 27th, 28th; Florence and Tucson, Ariz., 10th; Albany, Oreg., 12th, 20th, 21st, 23d. Clinton, Iowa, 2d, 3 p. m., an unusually conspicuous and brilliant halo of 22° radius was observed. Outside of this there was a part of a halo of much larger radius, while the parhelic circle extended parallel with the horizon, completely around the heavens. Fine parhelia were visible.

Lunar halos.—Have been observed in the various districts on the following dates: New England, 6th, 8th, 9th, 23d, 25th, 29th; Middle Atlantic States, 1st to 8th, 23d, 25th to 28th, 31st; South Atlantic States, 1st, 25th, 26th, 27th, 29th; Florida Peninsula, 1st, 25th, 27th, 28th, 31st; East Gulf States, 22d, 27th, 28th; West Gulf States, 1st, 4th, 9th, 15th, 24th, 25th; Ohio Valley and Tennessee, 1st, 3d, 4th, 6th to 9th, 11th, 14th, 21st, 23d, 27th to 31st; Lower Lake region, 1st to 5th, 8th, 9th, 25th, 28th, 31st; Upper Lake region, 1st, 2d, 19th, 22d, 23d, 24th, 27th, 28th, 29th, 31st; Upper Mississippi Valley, 2d, 3d, 11th, 14th, 20th, 23d, 24th, 25th, 27th, 31st; Missouri Valley, 1st, 2d, 3d, 23d to 29th; Northern Slope, 10th, 22d, 29th, 30th; Middle Slope, 10th, 25th, 28th, 29th; Northern Plateau, 1st, 29th; Middle Plateau, 1st, 2d, 4th, 8th, 10th, 24th; Middle Pacific Coast region, 3d, 24th, 26th, 28th; South Pacific Coast region, 2d, 3d, 11th. They were also reported from the following stations not included in the districts named above: Eagle Pass, Tex., 3d; Brownsville, Tex., 29th; Moorhead, Minn., 31st; El Paso, Tex., 12th; Florence, Ariz., 11th, 25th; Roseburgh, Oreg., 6th. An exceptionally brilliant display occurred at Northfield, Minn., on the 29th. There were two rings; one around the moon, and the other passing through it. The circle around the moon showed the prismatic colors very distinctly; the other was white.

Mirage.—New Haven, 5th, a well-defined mirage was observed over Long Island. The island seemed unusually prominent and above it appeared its inverted image. Indianola, Tex., 8th, 28th. Olivet, Dak., 27th. Northport, Mich., 5th, 3 to 4 p. m.

MISCELLANEOUS PHENOMENA.

Meteors.—Davenport, 12th; Fort Benton, Mont., 8th; Florence, Ariz., 24th; Yuma, Ariz., 29th; Vevay, Ind., 13th, 31st; Monticello, Iowa, 22d; Holton, Kans., 10th; Woodstock, Md., 3d, 12th, 14th, 21st, 22d; Rowe, Mass., 19th; Freehold, N. J., 13th; Rio Vista, Cal., 27th.

Polar bands.—Saint Louis, 30th; Florence, Ariz., 13th; Riley, Ill., 29th; New Corydon, Ind., 1st, 3d, 12th, 19th, 23d, 29th, 30th; Yates Center, Kans., 4th, 5th, 11th; Cornish, Me., 26th; Auburn, N. H., 5th, 8th; Atco, N. J., 29th; Wytheville, Va., 3d, 11th, 31st.

Earthquakes.—San Diego, Cal., 11th, about 4 p. m., slight shock, from north to south, of very short duration. San Francisco, 16th, 1.46 p. m., light shock felt in city. Salinas City, Cal., light shocks of earthquakes felt twice during month. Poway, Cal., 11th, 3.30 p. m., slight shock.

Sunsets.—The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 185 stations show 5,690 observations to have been made, of which 29 were reported doubtful; of the remainder, 5,661, or 85.3 per cent., were followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, director of the Lawrence Observatory, Amherst, Mass.:

Date—March, 1882.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.
3, 9 a. m.	1	‡20	....	....	....	....	2	‡25
4, 11 a. m.	0	0	0	0	0	0	2	‡25
5, 10 a. m.	2	3	0	0	1	2	4	‡30
8, 11 a. m.	1	2	....	....	1	2	5	‡30
13, 10 a. m.	3	12	....	....	....	....	5	‡20
14, 11 a. m.	1	3	0	0	0	0	6	‡23
17, 11 a. m.	1	‡10	....	....	....	....	3	‡25
18, 8 a. m.	0	5	1	5	0	0	2	‡20
19, 2 p. m.	2	15	0	0	0	0	4	‡35
20, 11 a. m.	0	0	0	0	0	0	4	‡35
22, 3 p. m.	1	2	1	5	1	2	4	‡30
23, 10 a. m.	0	0	0	0	0	0	4	‡30
25, 12 m	0	0	0	0	0	0	4	‡30
28, 2 p. m.	0	0	1	‡10	0	0	3	‡15
29, 11 a. m.	2	5	0	0	1	2	5	‡20
30, 1 p. m.	2	‡15	1	3	1	5	6	‡35
31, 8 a. m.	0	0	1	5	0	0	5	‡30

‡Approximated. Faculæ were seen at the time of every observation.

The following record of observations has been forwarded by Mr. A. G. Bender, Sacramento, Cal.: 2d, 11.30 a. m., one group, twenty spots; this might be regarded as two groups, but they are close together; 3d, 11.30 a. m., one group, twenty spots; two of the smaller spots much enlarged; 4th, 12 m., two groups, thirty spots; one new group, six spots; first group much changed; second group appeared near center of upper section; 5th, 11.30 a. m., two groups twenty spots; one group, one spot, reappeared by rotation; the new group seen on 4th, not visible; 6th, 1 p. m., two groups, twenty spots; the first-named group continues to change in number and form of spots; 7th, 1 p. m., five groups, twenty-five spots, one new group, two spots appeared near center of upper section; 8th, 1 p. m., four groups, twelve spots; one new group, one spot; first named group changed to five large and three small spots; 9th, 12 m., four groups, twelve spots; 10th, 11.45 a. m., six groups, thirty-five spots; two new groups, seven spots; one of the earlier groups first showing two spots now shows ten or more; the new groups appeared one in each section; 11th, 1 p. m., seven groups, thirty-five or forty spots; one group reappeared by rotation; much change in groups since 10th; 12th, six groups, thirty spots; one group, five spots, disappeared by rotation; a little cloudy; 14th, 3.15 p. m., five groups, twenty-five or thirty spots; cloudy, but occasional views show one group, one spot, to have disappeared by rotation; 16th, 11.30 a. m., five groups, ten spots; one new group, three spots; one group, one spot, disappeared by rotation; new group is near one already seen; 17th, 12 m., three groups, fifteen to twenty spots; one group, one spot, disappeared by rotation or became connected by new spots with another; 18th, 12 m., three groups, nine spots; much change in appearance of two groups; 19th, four groups, twenty-five spots; one new group, eight spots, near center of upper section, changing while under observation; 20th, 1 p. m., four groups, thirty-five spots; a large cluster added to the spot which appeared on the 11th; 21st, 1 p. m., four groups, three spots; one group, five spots, disappeared by rotation; one group, one spot, reappeared by rotation; the cluster mentioned on 20th has become dim, except one spot; 22d, 12.45 p. m., four groups, thirty spots; one new group, three spots; one group, five spots, disappeared by rotation; one new spot near the one that appeared on 21st; new group in left part of lower section, rather dim, cluster seen on 20th still dim; day a little cloudy; 23d, 12.30 p. m., six groups, forty to fifty spots; two new groups, ten spots near center of lower section; 24th, 1.30 p. m., six groups, thirty-five spots; some spots disappeared; 25th, 1.30 p. m., four groups, twenty-five spots; one group disappeared by rotation; group first seen on 22d has also disappeared; 26th, 1 p. m., three groups, twenty spots; one group, five spots disappeared by rotation; some of the spots also disappeared; 27th, 12 m., four groups, twenty spots; one new group, two spots, appeared to the right of center of upper section; 28th 1.15 p. m., three groups, ten spots; one group, two spots, disappeared by rotation; 29th, 12 m., three groups, three spots; one new group, one spot, possibly appeared by rotation; one group, seven spots, disappeared by rotation; 30th, 1.30 p. m., two groups, six spots; some new spots appear near a former single one; one group, one spot, disappeared by rotation; 31st, 12 m., two groups, six spots. Mr. William Dawson, at Spiceland, Ind., reports: 1st, two groups, seven spots, one large spot, 4′ from east edge; 2d, two groups, twenty spots; 5th, four groups, thirty-five spots; large group of thirty spots, west of center and one large spot near east edge; 15th, six groups, twenty spots, five of them large; 19th, four groups, sixty spots; one large spot 8′ from east edge; 31st, seven groups, thirty spots; the large spot nearing the west edge has nearly or quite divided into two. Mr. David Trowbridge, at Waterburgh, N. Y., reports: 2d, one group, three spots; 3d, one group (same as on 2d), six spots; 4th, two groups, eight spots; a new group has arisen near middle of disk; 8th, four groups, eight spots; 11th, six groups, seven spots; one group has just appeared by rotation; 17th, three groups, five spots; 19th, three groups (same as 17th), ten large spots; 20th, four groups, eleven spots; 29th, five groups, five spots, all faint but one; one group appeared by rotation. Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: sun spots were observed on every clear day during the month. They were most numerous on the 10th, and least numerous on the 1st; largest on the 26th, and smallest on the 31st.

Sand-storms.—Leavenworth, 21st; Fort Cummins, N. Mex., 24th; San Carlos, Ariz., 17th, 22d, 27th, 28th; Tucson, Ariz., 3d; Yuma, Ariz., 3d, 6th, 7th, 25th; Camp Thomas, Ariz., 3d, 5th, 13th, 17th, 22d, 25th; Umatilla, Oreg., 24th to 28th; on the latter date trains were delayed on account of the track being covered with sand. Fort Garland, Colo., 17th. Saint Louis, Missouri Weather Service reports: during heavy gale which covered the State on 21st, a marked dust-storm was reported from Greenfield, Clinton, Harrisonville, Pleasant Hill, Lexington, and Savannah, in the western part of the State.

Prairie and forest fires.—Fort Gibson, Ind. T., 12th, 15th, 18th, 25th. Omaha, 3d, 28th; that of the latter date was very disastrous. In Sarpy County barns, corn-cribs, stock, and other property were destroyed. A man in attempting to rescue a team was fatally burned. Yankton, 10th, 15th, 17th, 22d, 28th, 31st. Terry's Landing, Mont., 22d. Fort Supply, Ind. T., 4th, 14th. Dodge City, Kans., 22d, 28th. Pike's Peak, 14th, 15th. Fort Bayard, N. Mex., 30th. Yates Center, Kans., 2d. Council Grove, Kans., 16th. Protem, Mo., 15th, 16th, 21st, 22d. Lincoln, Nebr., 25th. Fayetteville, N. C., 25th. North Platte, Nebr., 14th, 25th. Alexandria, Dak., 27th, 28th.

Zodiacal light.—New Haven, 7th, 8th; Cedar Keys, Fla., 7th, 20th; Punta Rassa, Fla., 9th; Nashville, 9th, 10th, 13th, 15th, 18th, 19th; Saint Vincent, Minn., 8th; Springfield, Ill., 13th; New Corydon, Ind., 12th, 13th; Clinton, Iowa, 12th, 13th; Monticello, Iowa, 13th, 18th; Yates Center, Kans., 10th, 12th, 14th; Cornish, Me., 7th, 8th, 13th, 14th; Orono, Me., 7th, 8th; Harvard College, Cambridge, Mass., suspected, 15th, 20th, 24th, 25th; distinct, 8th, 11th, 13th, 14th, 17th, 19th, 25th; Somerset, Mass., 8th, 11th, 19th; Williamstown, Mass., 17th, 19th; Fall River, Mass., 18th, 19th; Rowe, Mass., 14th, 19th; Fayetteville, N. C., 11th, 12th, 13th; Albany, Oreg., 10th; Dyberry, Pa., 8th.

Migration of birds.—*Geese flying southward:* Indianola, 12th; Port Huron, 30th; Yankton, Dak., 17th, 19th; Charleston, Ill., 5th. *Geese flying northward:* Alexandria, Dak., 16th; Indianola, 2d; Champaign, Ill., 5th; Bismarck, Dak., 30th, 31st; Dubuque, 2d; Des Moines, 18th; Davenport, 4th; Yankton, Dak., 21st, 22d, 26th; Leavenworth, 16th; Cheyenne, Wyo., 2d; Terry's Landing, Mont., 16th; Fort Assinaboine, Mont., 31st; Portland, Oreg., 10th; Fort Hale, Dak., 16th; Logansport, Ind., 5th; Monticello, Iowa, 17th; Cedar Rapids, Iowa, 1st; Protem, Mo., 1st; Palermo, N. Y., 20th; Wellsborough, Pa., 5th. *Ducks flying southward:* Indianola, 13th; Port Huron, 18th; Yankton, Dak., 19th; Charleston, Ill., 5th. *Ducks flying northward:* Alexandria, Dak., 16th; Fort Macon, N. C., 12th; Detroit, Mich., 5th to 8th; Toledo, 2d; Dubuque, 2d; Yankton, Dak., 22d, 26th; Charleston, Ill., 23d; Monticello, Iowa, 5th, 27th; Des Moines, 17th; Northfield, Minn., 10th. *Cranes flying northward:* Fort Gibson, Ind. T., 18th; Charleston, Ill., 15th; Nora Springs, Iowa, 29th; Des Moines, Iowa, 1st, 17th; Fayette, Miss., 14th; Protem, Mo., 19th; Murfreesborough, Tenn., 9th, 10th. *Sandbills flying northward:* Fort Gibson, Ind. T., 18th. *Pigeons flying northward:* Monticello, Iowa, 5th, 27th.

Published by order of the Secretary of War:

W. B. HAZEN,
Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

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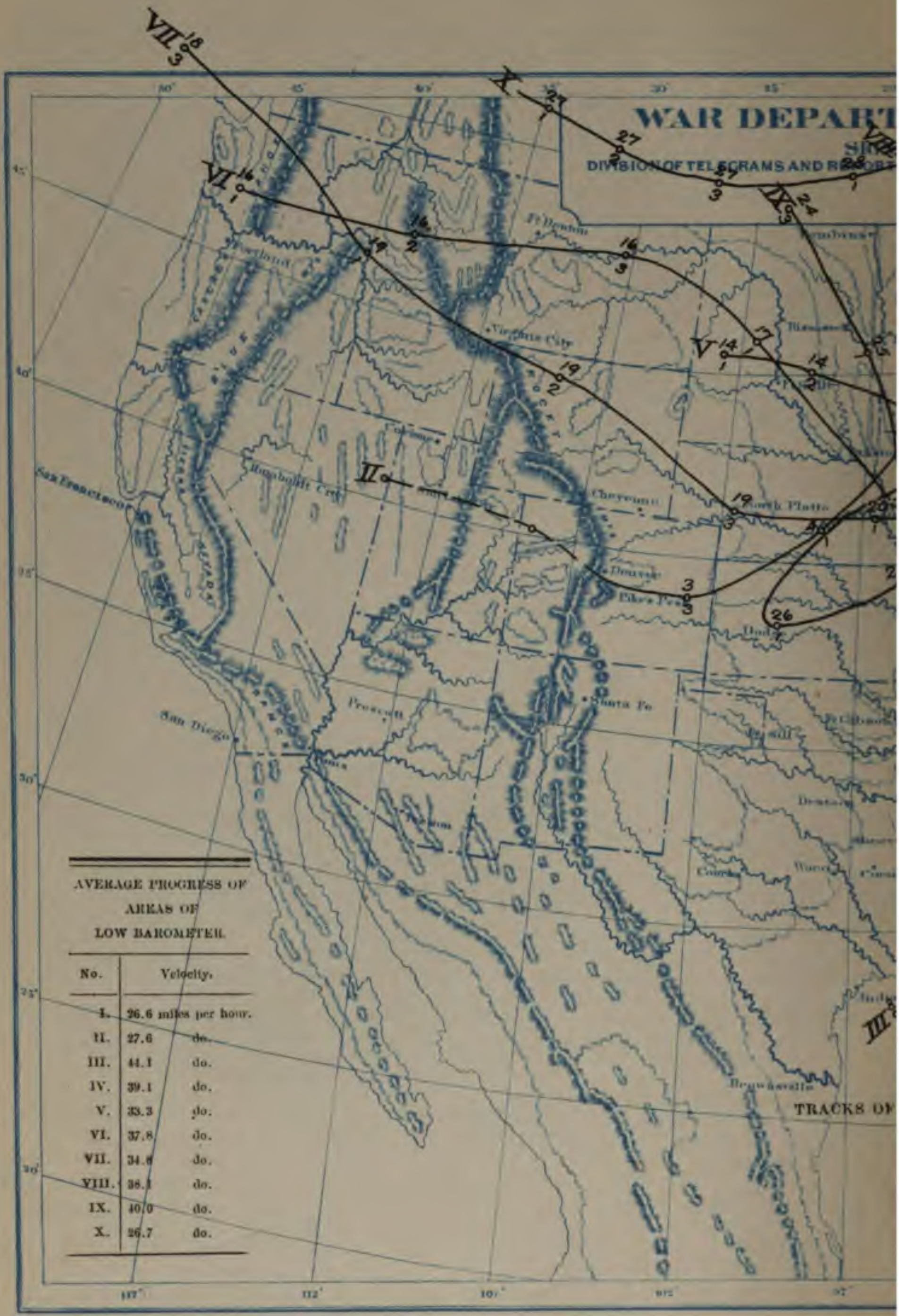
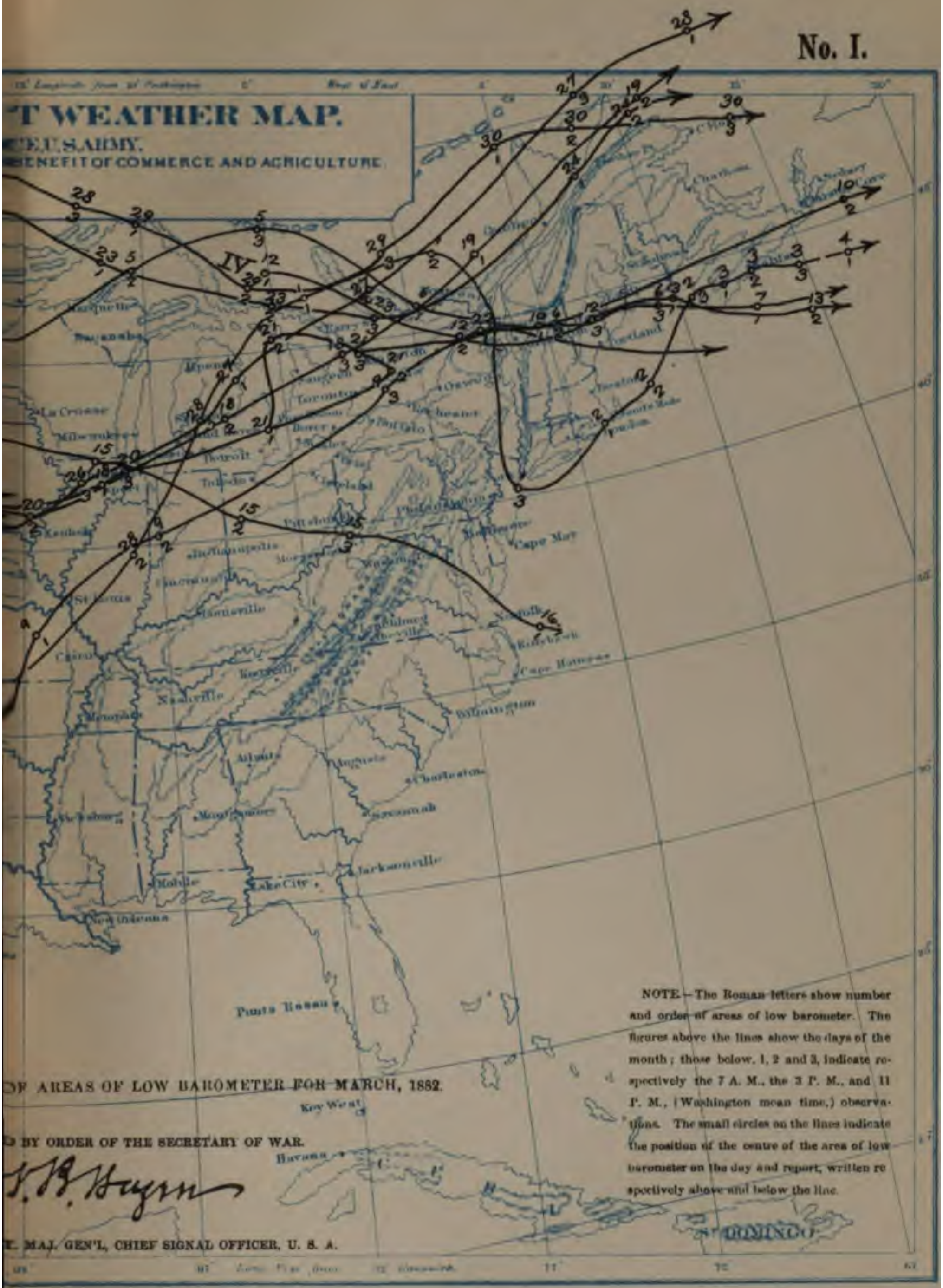


AVERAGE PROGRESS OF
AREAS OF
LOW BAROMETER.

No.	Velocity.
I.	26.6 miles per hour.
II.	27.6 do.
III.	44.1 do.
IV.	39.1 do.
V.	33.3 do.
VI.	37.8 do.
VII.	34.8 do.
VIII.	38.1 do.
IX.	40.0 do.
X.	26.7 do.

No. I.



T WEATHER MAP.

E.U.S.ARMY.

ENEFIT OF COMMERCE AND AGRICULTURE.

F AREAS OF LOW BAROMETER FOR MARCH, 1882.

BY ORDER OF THE SECRETARY OF WAR.

.B. Hazen

. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 3 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

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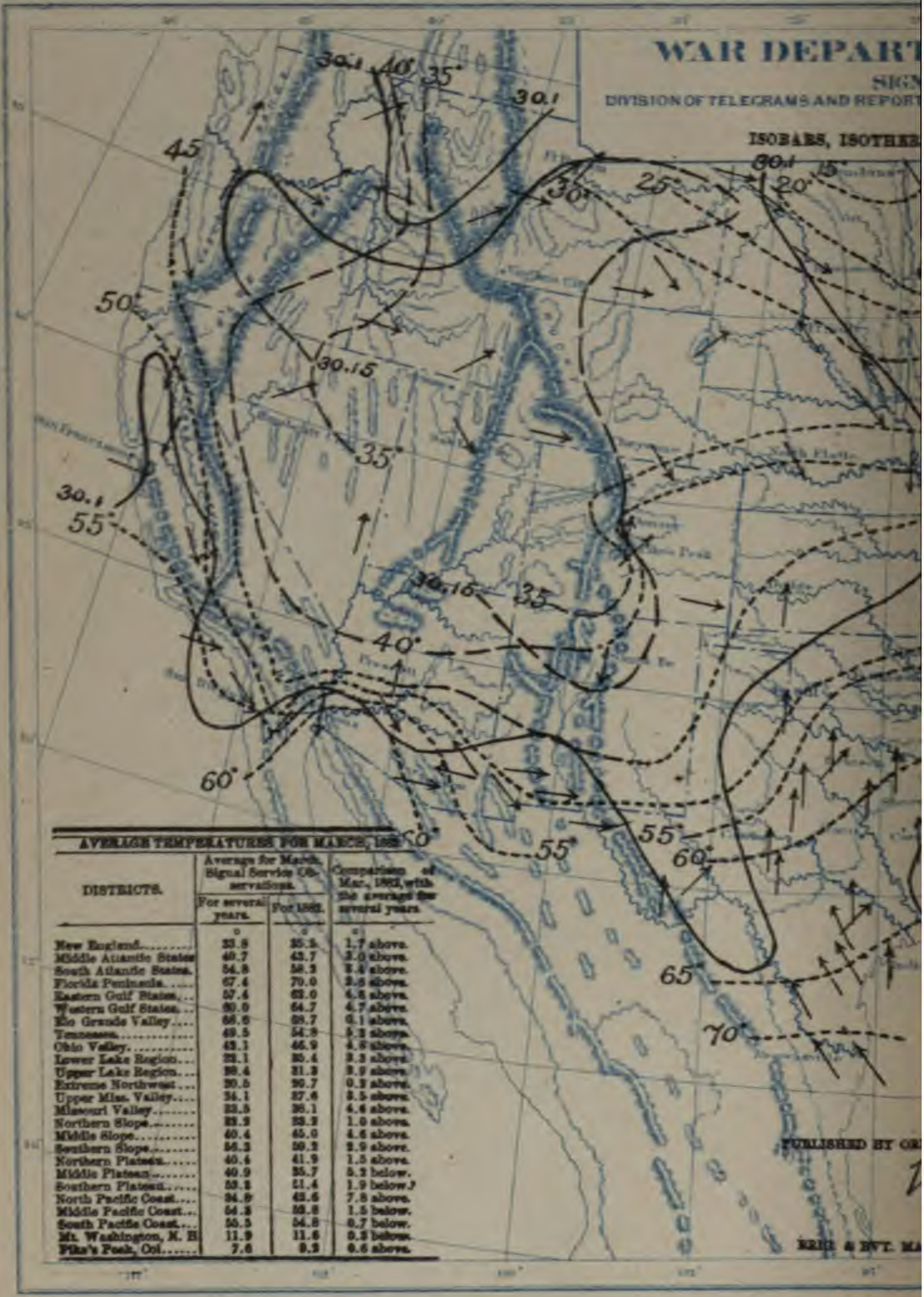
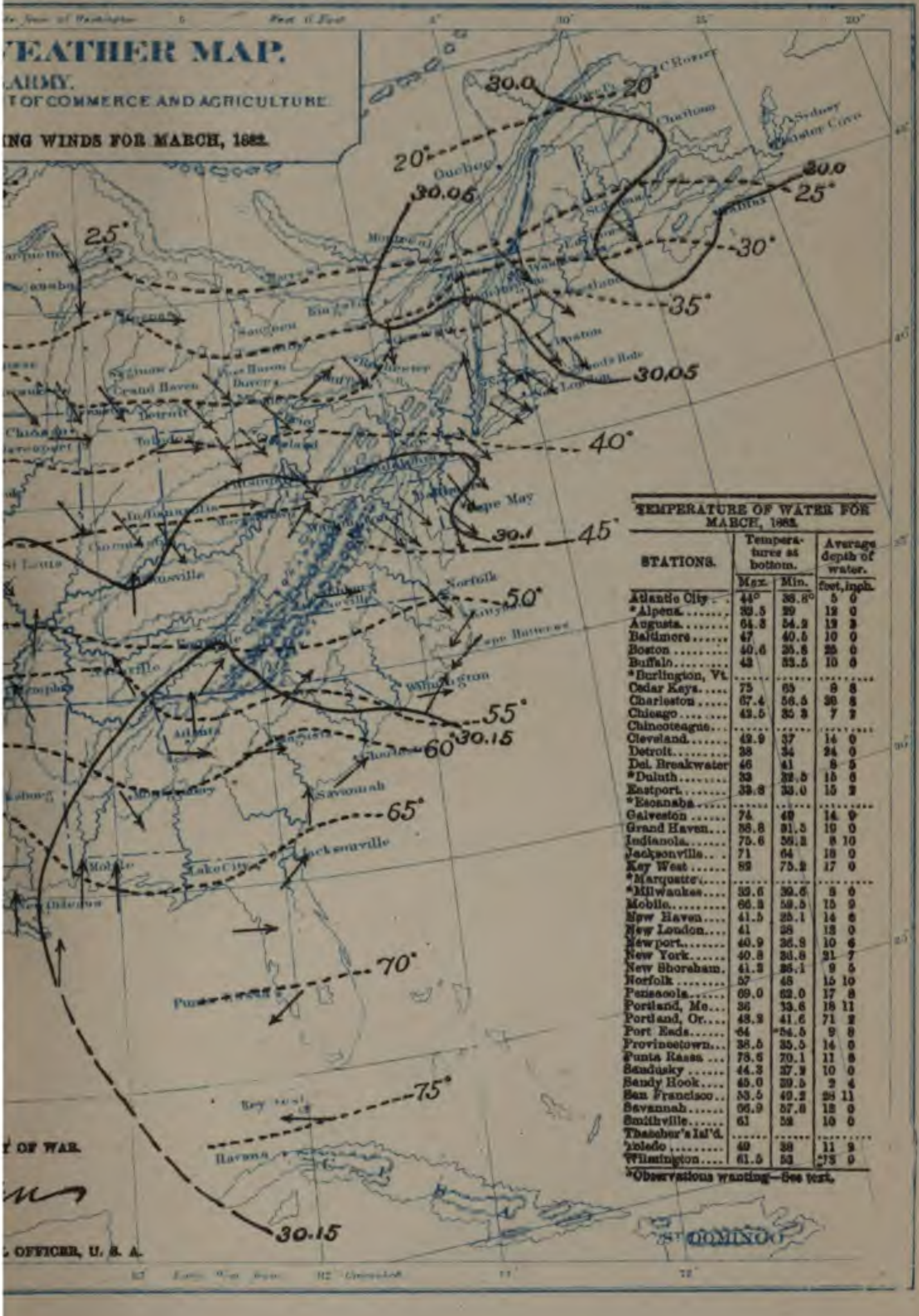


AVERAGE TEMPERATURES FOR MARCH, 1882.

DISTRICTS.	Average for March, Signal Service Observations. For several years.	For 1882.	Comparison of Mar., 1882, with the average for several years.
	°	°	°
New England	33.8	35.5	1.7 above.
Middle Atlantic States	40.7	43.7	3.0 above.
South Atlantic States	54.8	58.2	3.4 above.
Florida Peninsula	67.4	70.0	2.6 above.
Eastern Gulf States	57.4	62.0	4.6 above.
Western Gulf States	60.0	64.7	4.7 above.
Rio Grande Valley	68.6	68.7	0.1 above.
Tennessee	49.5	54.8	5.3 above.
Ohio Valley	42.1	46.9	4.8 above.
Lower Lake Region	32.1	35.4	3.3 above.
Upper Lake Region	28.4	31.3	2.9 above.
Extreme Northwest	20.5	20.7	0.2 above.
Upper Miss. Valley	34.1	37.6	3.5 above.
Missouri Valley	33.5	38.1	4.6 above.
Northern Slope	32.3	33.3	1.0 above.
Middle Slope	40.4	45.0	4.6 above.
Southern Slope	56.3	59.2	2.9 above.
Northern Plateau	40.4	41.9	1.5 above.
Middle Plateau	40.9	35.7	5.2 below.
Southern Plateau	53.3	51.4	1.9 below.
North Pacific Coast	34.8	42.6	7.8 above.
Middle Pacific Coast	54.3	52.8	1.5 below.
South Pacific Coast	55.5	54.8	0.7 below.
Mt. Washington, N. H.	11.9	11.6	0.3 below.
Pike's Peak, Col	7.6	8.2	0.6 above.

No. II.



TEMPERATURE OF WATER FOR MARCH, 1882.

STATIONS.	Temperatures at bottom.		Average depth of water.	
	Max.	Min.	feet,	inch.
Atlantic City	44°	38.8°	5	0
*Alpena	39.5	29	12	0
Augusta	64.3	54.2	13	3
Baltimore	47	40.5	10	0
Boston	40.6	35.8	25	0
Buffalo	42	33.5	10	0
*Burlington, Vt.	......	......	......	......
Cedar Keys	75	65	8	8
Charleston	67.4	56.5	36	8
Chicago	42.5	35 3	7	7
Chincoteague	......	......	......	......
Cleveland	42.9	37	14	0
Detroit	38	34	24	0
Del. Breakwater	46	41	8	5
*Duluth	33	32.5	15	6
Eastport	33.8	33.0	15	2
*Escanaba	......	......	......	......
Galveston	74	49	14	9
Grand Haven	36.8	31.5	19	0
Indianola	75.6	56.2	8	10
Jacksonville	71	64	18	0
Key West	82	75.2	17	0
*Marquette	......	......	......	......
*Milwaukee	32.6	32.6	8	0
Mobile	66.3	59.5	15	9
New Haven	41.5	25.1	14	6
New London	41	28	13	0
Newport	40.9	36.9	10	6
New York	40.8	35.8	21	7
New Shoreham	41.3	36.1	9	5
Norfolk	57	48	15	10
Pensacola	69.0	62.0	17	8
Portland, Me	36	33.6	18	11
Portland, Or	48.3	41.6	71	2
Port Eads	64	*54.5	9	8
Provincetown	38.5	35.5	14	0
Punta Rassa	78.5	70.1	11	8
Sandusky	44.3	37.2	10	0
Sandy Hook	45.0	39.5	2	4
San Francisco	53.5	49.2	28	11
Savannah	66.9	57.8	12	0
Smithville	61	52	10	0
Thatcher's Isl'd	......	......	......	......
Toledo	40	38	11	9
Wilmington	61.5	53	*75	0

*Observations wanting—See text.

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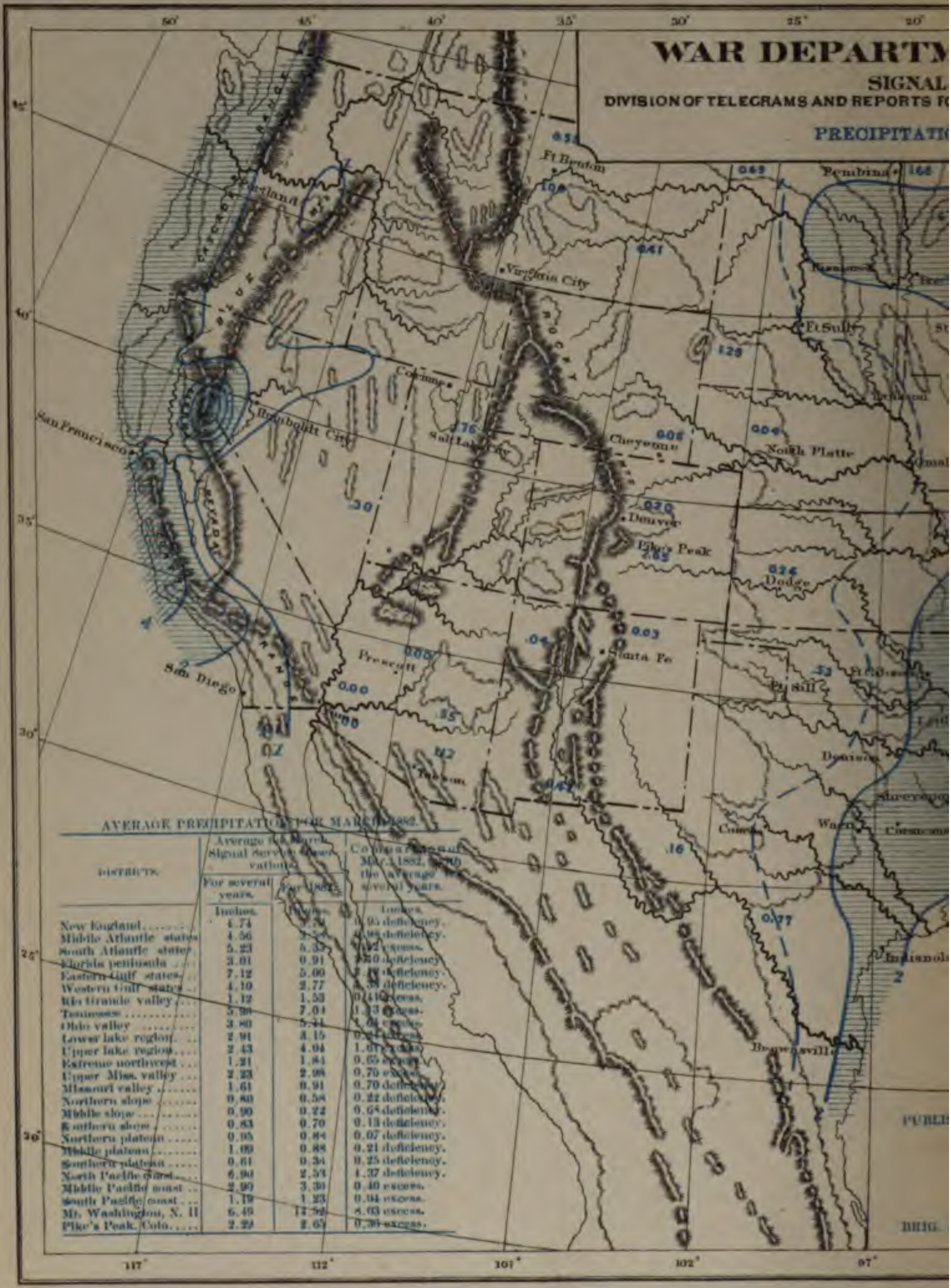


AVERAGE PRECIPITATION FOR MARCH, 1882.

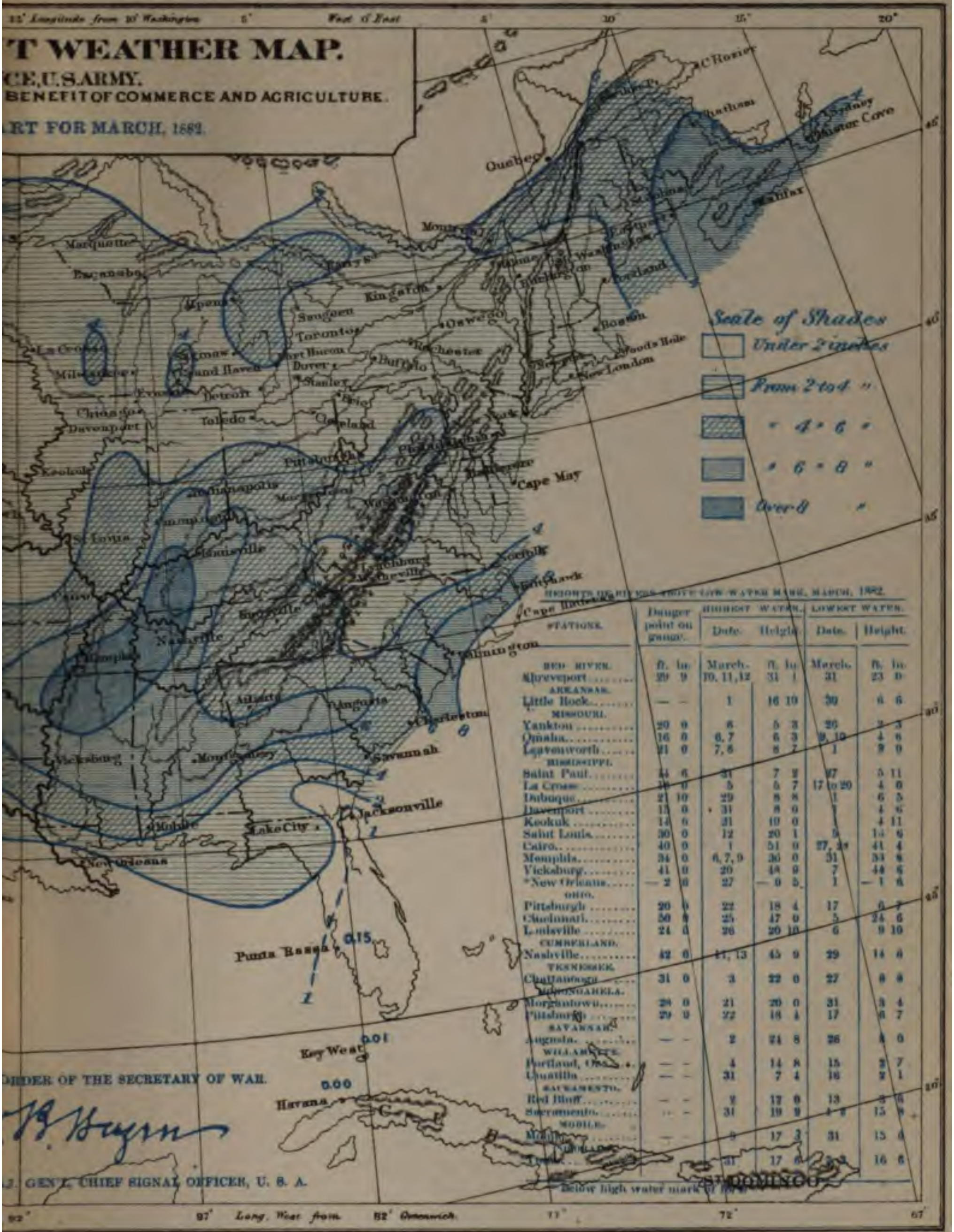
DISTRICTS.	Average for March, Signal Service observations.		Comparison of Mar., 1882, with the average for several years.
	For several years.	For 1882.	
	Inches.	Inches.	Inches.
New England	4.74	[illegible]	0.95 deficiency.
Middle Atlantic states	4.56	[illegible]	0.98 deficiency.
South Atlantic states	5.23	5.35	0.12 excess.
Florida peninsula	3.01	0.91	2.10 deficiency.
Eastern Gulf states	7.12	5.00	2.12 deficiency.
Western Gulf states	4.10	2.77	1.33 deficiency.
Rio Grande valley	1.12	1.53	0.41 excess.
Tennessee	5.98	7.01	1.03 excess.
Ohio valley	3.80	5.41	1.61 excess.
Lower lake region	2.91	3.15	0.24 excess.
Upper lake region	2.43	4.04	1.61 excess.
Extreme northwest	1.21	1.84	0.63 excess.
Upper Miss. valley	2.23	2.98	0.75 excess.
Missouri valley	1.61	0.91	0.70 deficiency.
Northern slope	0.80	0.58	0.22 deficiency.
Middle slope	0.90	0.22	0.68 deficiency.
Southern slope	0.83	0.70	0.13 deficiency.
Northern plateau	0.95	0.88	0.07 deficiency.
Middle plateau	1.09	0.88	0.21 deficiency.
Southern plateau	0.61	0.36	0.25 deficiency.
North Pacific coast	6.90	2.53	4.37 deficiency.
Middle Pacific coast	2.90	3.30	0.40 excess.
South Pacific coast	1.19	1.23	0.04 excess.
Mt. Washington, N. H.	6.49	12.52	6.03 excess.
Pike's Peak, Colo.	2.29	2.65	0.36 excess.

No. III.

T WEATHER MAP.

CE, U.S. ARMY.
BENEFIT OF COMMERCE AND AGRICULTURE.

ART FOR MARCH, 1882.



HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, MARCH, 1882.

STATIONS.	Danger point on gauge.		HIGHEST WATER.			LOWEST WATER.		
			Date.	Height.		Date.	Height.	
RED RIVER.	ft.	in.	March.	ft.	in.	March.	ft.	in.
Shreveport	29	9	10, 11, 12	31	1	31	23	0
ARKANSAS.								
Little Rock	—	—	1	16	10	30	6	6
MISSOURI.								
Yankton	20	0	6	5	3	26	2	3
Omaha	16	0	6, 7	6	3	9, 10	4	8
Leavenworth	21	0	7, 8	8	7	1	9	0
MISSISSIPPI.								
Saint Paul	14	6	31	7	2	27	5	11
La Crosse	[illegible]	0	5	5	7	17 to 20	4	0
Dubuque	21	10	29	8	8	1	6	5
Davenport	15	0	31	8	0	1	4	6
Keokuk	14	6	31	10	0	1	4	11
Saint Louis	30	0	12	20	1	5	14	6
Cairo	40	0	1	51	0	27, 28	41	4
Memphis	34	0	6, 7, 9	36	0	31	34	8
Vicksburg	41	0	20	48	9	7	44	6
*New Orleans	— 2	6	27	— 0	5	1	— 1	6
OHIO.								
Pittsburgh	29	0	22	18	4	17	6	7
Cincinnati	50	0	25	47	0	5	24	6
Louisville	24	0	26	20	10	6	9	10
CUMBERLAND.								
Nashville	42	0	11, 13	45	9	29	14	0
TENNESSEE.								
Chattanooga	31	0	3	22	0	27	8	8
MONONGAHELA.								
Morgantown	28	0	21	20	0	31	3	4
Pittsburgh	29	0	22	18	4	17	6	7
SAVANNAH.								
Augusta	—	—	2	21	8	26	[illegible]	0
WILLAMETTE.								
Portland, Oreg.	—	—	4	14	8	15	2	7
Umatilla	—	—	31	7	4	16	2	1
SACRAMENTO.								
Red Bluff	—	—	2	12	0	13	3	6
Sacramento	—	—	31	19	9	1, 2	15	8
MOBILE.								
Mobile	—	—	9	17	3	31	15	6
[illegible]								
[illegible]			31	17	6	2, 3	16	6

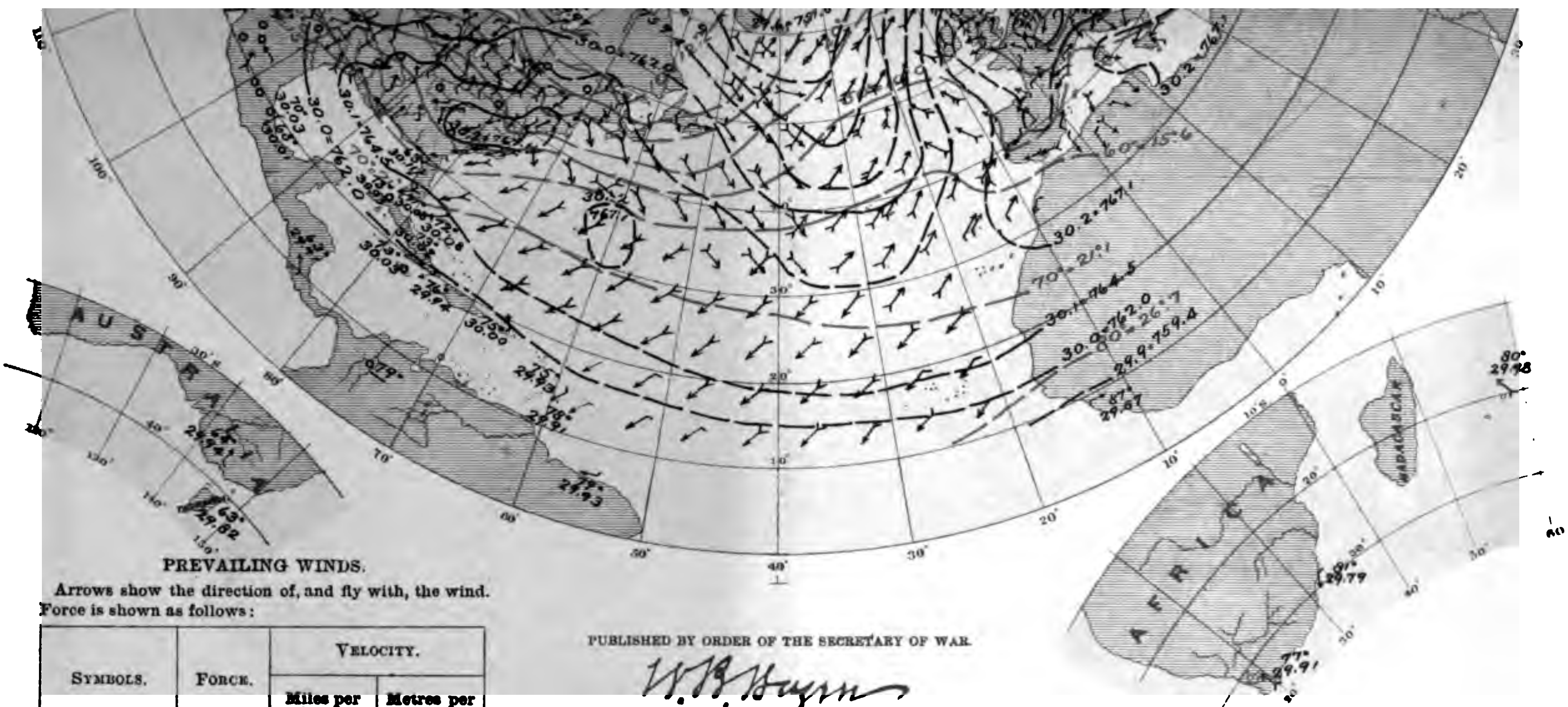
*Below high water mark of 1874.

ORDER OF THE SECRETARY OF WAR.

B. Hazen

J. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

44



PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind. Force is shown as follows:

Symbols.	Force.	Velocity.	
		Miles per hour.	Metres per second.
⊙	0	0	0
—→	1, 2	0 to 9	0 to 4.0
>—→	3, 4	9.1 to 22.5	4.1 to 10.1
≫—→	5, 6	22.6 to 40.5	10.1 to 18.1
⋙—→	7, 8	40.6 to 67.5	18.1 to 30.2
⋙—→	9, 10	67.6 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

INTERNATIONAL MONTHLY CHART.

Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of January, 1880, based on the daily charts of the International Bulletin.

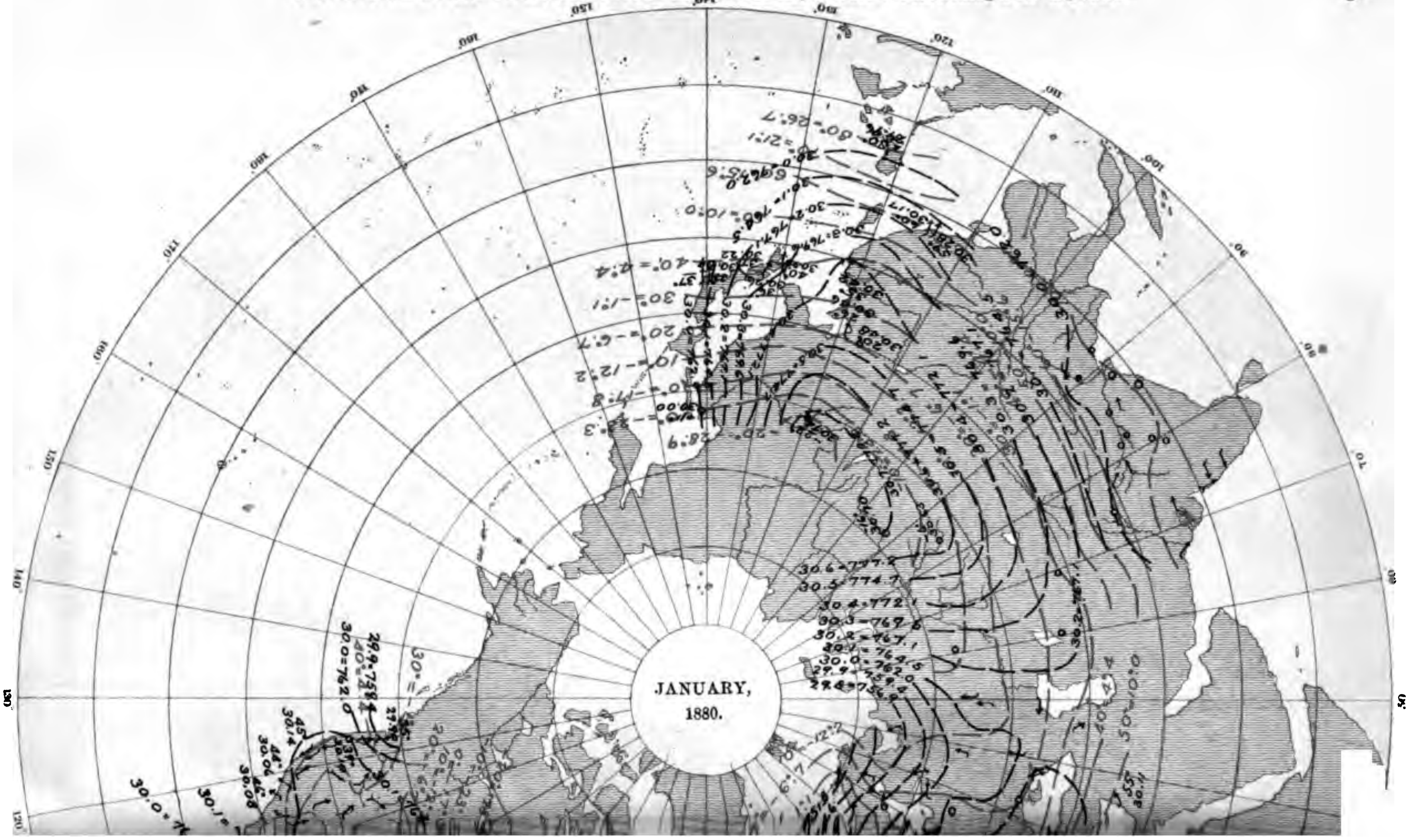
ISOBARS AND ISOTHERMS.

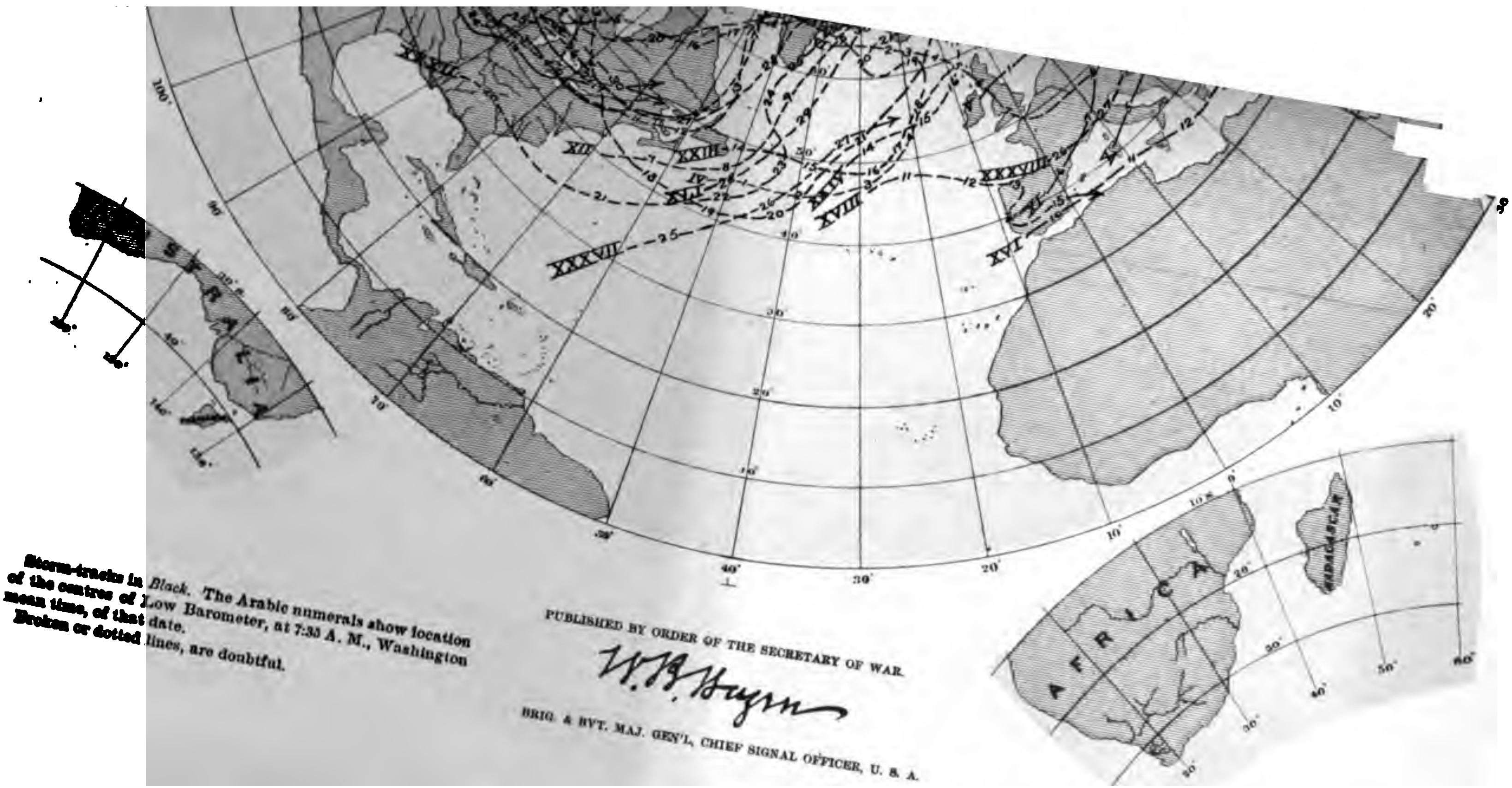
Isobars in *Black*. detached barometer means in English inches.

Isotherms in *red*; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.





Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.
Broken or dotted lines, are doubtful.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

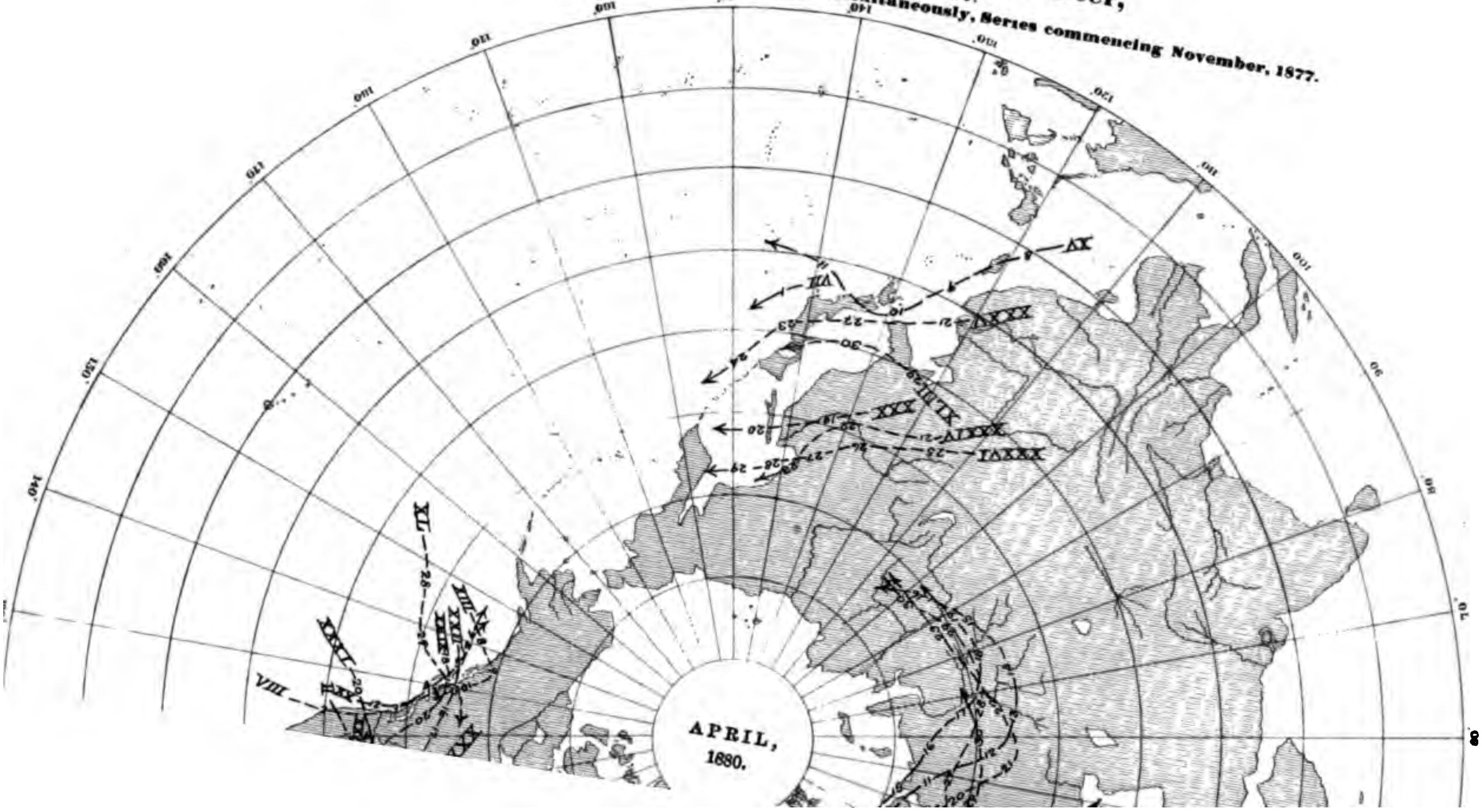
INTERNATIONAL CHART.
Showing Tracks of Centres of Low Bar
April, 18

ice of the Chief Signal Officer,

UNITED STATES ARMY.

harted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No.



APPENDIX No. 85.

MONTHLY WEATHER REVIEW, APRIL, 1882.

INTRODUCTION.

This Review presents a general summary of the meterological data collected by the Signal Service during the month of April, 1882.

The weather has been particularly favorable for agricultural pursuits in almost every section of the country, and trustworthy reports indicate that the crops of cereals will be above the average, and in the southern sections of the country, where there is an unusually large acreage of wheat, an early and abundant crop is anticipated.

The April rains on the Pacific coast have placed the crop in that region out of danger, and in the southern sections of California the pasturage is reported to be excellent.

In the Northwestern States, and in sections of Tennessee and Kentucky, the peach, cherry, and pear crops were injured by April frosts, while in the eastern sections of the country the fruit crop is well advanced and promises to compare favorably with the average yield.

The severe storms of the month passed over the central part of the United States from Colorado eastward, south of the average course of April storms, and were in almost every case attended by local storms and tornadoes which proved destructive to both life and property.

A new feature of the Weather Review will be found under the head of Cotton Region Reports. The Chief Signal Officer has recently begun a system of daily telegraphic reports for the benefit of those interested in this staple, and the accompanying table gives the monthly mean of the maximum and minimum temperatures and the average rainfall for the month in the various cotton districts throughout the South.

A general interpretation of the reports for the month will show that the weather has been favorable; the observer at Chattanooga reports that cotton-planting is proceeding rapidly and that the acreage is 40 per cent. greater than in 1881. It is estimated that 25,000 bales will be produced in Hamilton County, Tennessee.

That part of the Review referring to International Meteorology presents the general weather conditions which prevailed over the northern hemisphere during the month of February, 1880, and the tracks of barometric minima for May, 1880, traced from simultaneous observations taken at 7.35 a. m., Washington mean time. It will be seen that the cold weather which prevailed over Europe during January, 1880, continued until about the 10th of February, when the extended area of high barometer in that region disappeared, and was followed by a succession of storms over northern and northwestern Europe, attended by southerly winds and warmer weather.

The magnetic storm which occurred during the auroral display of the 16th is of special interest. Reports show that the display was visible westward from the British Isles to the Pacific coast, and that vessels on the Atlantic apparently changed their course both to the north and south of the true course when the display was most brilliant.

An unusual number of icebergs were encountered by vessels in the North Atlantic during the month, and at the close of April the danger to shipping approaching the coast was very great. An examination of Chart No. VII, which exhibits the limits within which ice was observed, suggests the advisability of selecting the southern routes for vessels passing to and from Europe at this season of the year. Under the heading of Ocean Ice will be found special reports giving the latitude and longitude in which icebergs were observed.

In the preparation of this Review the following data have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at one hundred and thirty-five Signal Service stations and fifteen Canadian stations, as telegraphed to this office; one hundred and ninety monthly journals and one hundred and seventy-three monthly means from the former, and fifteen monthly means from the latter; one hundred and ninety-five monthly registers from voluntary observers; sixty monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald Weather Service; abstracts of ships' logs, furnished by the publishers of The New York Maritime Register; monthly reports from the local weather services of Kansas, Nebraska, and Missouri, and of the Central Pacific Railway Company; trustworthy newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The mean barometric pressure for the month over the United States and Canada is shown by the isobarometric lines, in black, on Chart II. The area of lowest mean pressure extends from southern Arizona northeastward over northern New Mexico and the greater part of Colorado, while a second area of low pressure is central in the North Atlantic and extends to the westward over the Gulf of Saint Lawrence. The barometer is highest north of Lake Superior and Minnesota. From the chart it will be seen that the area of mean high barometer extends over the central part of the continent. Compared with the previous month, the pressure is from 0.05 to 0.1 of an inch lower at stations on the Atlantic and Gulf coasts. In the Rocky Mountain regions the pressure is from 15 to 0.25 lower. The area of low barometer now extends over the regions covered by the area of greatest pressure for March. On the Pacific coast, the pressure has remained about stationary at San Francisco and has fallen at stations north and south, the greatest change being in the north of Oregon. Compared with April, 1881, the mean pressure is from 0.1 to 0.25 of an inch greater in the northeastern part of the United States, 0.1 of an inch greater in the Lake region, and slightly less at stations in the southern part of the United States.

Departures from the normal values for the month.—Compared with the means of previous yearf, the pressure is slightly above the normal along the Atlantic coast, and from 0.05 to 0.1 of an inch above in the Lake region and Minnesota. It is slightly above the normal on the Pacific coast, and slightly below at stations in Colorado, New Mexico, and Utah.

Barometric Ranges.—The range of pressure during the present month has varied 0.2 of an inch to 1.4 inches, the least range being at Campo, Cal., and the greatest range at Eastport, Me.; generally the range increases with the latitude and from the Mississippi Valley eastward to the Atlantic coast. In the several districts the barometric ranges have been as follows: *New England:* 1.40 inches at Eastport; 1.23 inches at New Haven, and 0.97 of an inch on the summit of Mount Washington. *Middle Atlantic States:* 1.16 inches at New York; 0.92 of an inch at Lynchburgh. *South Atlantic States:* 1 inch at Cape Henry; 0.65 of an inch at Jacksonville. *Florida* 0.36 of an inch at Key West, and 0.55 of an inch at Cedar Key. *East Gulf States:* 0.69 of an inch at Montgomery, and 0.54 of an inch at Port Eads. *West Gulf States:* 0.80 of an inch at Fort Gibson, and 0. 62 of an inch at Brownsville. *Ohio Valley and Tennessee:* 0.94 of an inch at Columbus; 0.67 of an inch at Knoxville. *Lower Lake Region:* 1.22 inches at Oswego; 1.03 inches at Cleveland. *Upper Lake Region:* 1.24 inches at Alpena; 0.85 of an inch at Duluth. *Upper Mississippi Valley:* 1.04 inches at La Crosse; 0.84 of an inch at St. Paul. *Missouri Valley:* 0.96 of an inch at Omaha; 0.82 of an inch at Springfield, Mo. *Extreme Northwest:* 0.92 of an inch at Fort Buford; 0.77 of an inch at Moorhead. *Northern Slope:* 1.12 inches at Fort Shaw; 1.01 inches at Fort Keogh. *Middle Slope:* 0.95 of an inch at Dodge City; 0.64 of an inch at Pike's Peak. *Southern Slope:* 0.70 of an inch at Concho; 0.62 of an inch at Stockton. *Northern Plateau:* 0.89 of an inch at Spokane Falls, and 0.75 of an inch at Boise City. *Middle Plateau:* 0.69 of an inch at Salt Lake City; 0.50 of an inch at Winnemucca. *Southern Plateau:* 0.45 of an inch at Prescott; 0.35 of an inch at Florence. *North Pacific Coast:* 1.16 inches at Portland; 0.89 of an inch at Olympia. *Middle Pacific Coast:* 0.56 of an inch at Red Bluff; 0.45 of an inch at Sacramento. *South Pacific Coast:* 0. 46 of an inch at Yuma; 0.20 of an inch at Campo.

Areas of high barometer.—Six areas of high barometer have passed over the region of Signal Service stations during the month, four of which approached from the central part of British America and passed to the southeast over New England to the Atlantic, and two extended over the region west of the Mississippi, moving slowly to the eastward over the States south of the Ohio River. In addition to the areas of high barometer traced to the eastward, an extended period of high pressure occurred in central British America and northern United States from the 10th to the 14th of the month.

I.—The morning telegraphic report of the 2d indicated a rapid increase of pressure at Fort Garry and in the region of Lake Superior, immediately to the west of the storm which was then central in the Upper Saint Lawrence Valley. Northerly winds and light snows were reported from stations on Lake Superior, where the temperature had fallen 23° in the last sixteen hours. At the afternoon report of the 2d this area was central north of Lake Superior, apparently moving to the eastward. On the morning of the 3d the barometer had risen to 30.53 at Quebec, a rise of 0.4 of an inch in twenty-four hours, accompanied by northerly winds and temperature 15° above zero. The pressure increased at the center of this area, as it moved to the eastward, from 30.20 to 30.50. During the 4th the pressure increased at the stations on the Atlantic coast where the wind directions indicated that the course of this area became more southerly after leaving the coast line.

II.—This appeared first in the region north of the Upper Missouri Valley, following storm traced as low area II. At this report there was a rapid gradient in the northwest quadrant of the depression, which was central near Marquette, where the barometer read 29.71. At Fort Garry the barometer read 30.41, with northerly winds and temperature 4° above zero. This area passed to the eastward, north of the Signal Service stations near the 50th parallel of north latitude, until the center reached longitude 72 W., when the course changed to the southeast over northern New England to the Atlantic. As in the preceding area, the pressure increased at the center until it reached the coast; but after passing the coast line, the movement was more to the east, and at the stations on the South Atlantic coast the pressure changed but slightly. The winds shifted to the northeast on the New England and Middle Atlantic coasts, and the barometer was highest in the Saint Lawrence Valley, and light rains occurred at the coast stations, accompanied by winds ranging in velocities from 26 to 40 miles per hour between Capes Cod and Hatteras.

III.—This appeared in British America north of Dakota, at midnight of the 6th, when low area III was central in Colorado. During the 7th it moved directly to the east and was north of Lake Superior at midnight of that date, the low area referred to above remaining almost stationary.

On the morning of the 8th it extended north of the Lake region and the Upper Saint Lawrence Valley, the barometer at the center reaching 30.40. The succeeding reports show the gradual disappearance of this area, or a westerly movement, attended by the rapid advance of the depression III from Colorado. The barometer continued high at the northern stations, and by morning of the 9th the area of greatest pressure extended over Manitoba. The barometer continued high in this region, ranging from 30.30 to 30.50, causing northerly winds and low temperatures in the northern districts of the United States, with occasional snows in the Lake region and Canada.

On the 12th, light snows occurred in New York and New England. Stations in these districts were under the influence of an extended area of low barometer which passed from the Atlantic northward east of the New England coast. During the 13th and 14th the pressure remained above 30.40 in the region between the Mississippi and the Missouri Rivers, without a decided change in the pressure at stations south and east of this region until the 15th.

IV resulted from an easterly movement of the permanent area of high pressure which extended over the center of the continent from the 11th to the 14th. On the afternoon of the 14th the pressure was greatest in Manitoba and sixteen hours later it was greatest in central Texas, the isobar of 30.20 inclosing the regions of Lake Superior, southwestward, over Iowa, Missouri, Arkansas, Kansas, and Indian Territory. The advance of a low area from the Upper Missouri Valley attended a southeasterly movement of this area. The barometer remained highest near Cairo until midnight of the 16th, the pressure being above the normal from the northern lakes southward to the Gulf coast. On the 17th the pressure diminished rapidly west of the Mississippi, as this area disappeared off the South Atlantic coast.

V.—The midnight report of the 20th indicated the approach of this area from the region north of Lake Superior, while storm VIII was central in western Kansas. The barometer rose in the districts north of the Ohio River as the storm above referred to moved to the eastward, causing an increase of the barometric gradients in the northeastern quadrants of the depression. These conditions continued until the night of the 22d, when the high area was central north of Lake Huron and storm VIII was central in the Ohio Valley. The barometer continued high in the lake regions during the 23d, and it rose at stations to the westward, attended by northerly winds and fair weather in the districts north of Virginia and Tennessee. These conditions continued until the morning of the 26th, when the high area had advanced to the Canadian maritime provinces, the movement to the east being apparently increased by the advance of a storm which was then in the Mississippi Valley. The barometer continued near 30.30 in this area, as it moved off the northeast coast, being about the same pressure that was observed on the 20th, when it appeared in the northwest.

VI.—On the 27th, the pressure was about 30.30 on the coast stations of Oregon and Washington Territory, and cold northerly winds with light snow were reported at the northern Rocky Mountain stations. The midnight report of the 27th showed an increase of pressure to the eastward, the barometer ranging about 30.40 in the Upper Missouri Valley. By midnight of the 28th the barometer was rising as far eastward as the Lake region, and southward to Arkansas, the barometer reaching the maximum, 30.63, at Fort Custer at this report. The pressure decreased slowly at the center as this area extended over the central part of the United States on the 29th. A light norther occurred on the Texas coast between 3 and 11 p. m. on the 29th, with but a slight change in temperature. The center passed slowly over the Missouri Valley on the 30th, and at the close of the month was near Memphis, the isobar of 30.20 inclosing the States of the Lower Mississippi Valley and a part of Texas.

Areas of low barometer.—Eleven areas of low barometer have appeared within the limits of, or approached, the stations of observations during the month, which were sufficiently well-defined to render it possible to approximately determine the positions of the centers at consecutive telegraphic reports. The tracks of the centers of these depressions are exhibited as usual on Chart I. Compared with April of previous years, the barometric disturbances have been more numerous than in April of 1881, and less frequent than in April of 1879–'80.

The following table shows the number of areas of low barometer occurring during the month of April since 1873, as traced on Chart I of The Monthly Weather Review:

April, 1873	8
April, 1874	13
April, 1875	10
April, 1876	13
April, 1877	9
April, 1878	9
April, 1879	18
April, 1880	14
April, 1881	7
April, 1882	11

It will be seen from the above that the number of low areas occurring during the current month is the average number occurring for April, as determined from the past ten years of observations.

The following table gives the latitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First observed.		Last observed.		Average ho'rly velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° '	° '	° '	° '	
No. I	49 5	101 0	47 0	68 0	28.5
No. II	49 0	111 0	52 0	63 0	48.0
No. III	35 5	107 0	42 5	68 0	39.0
No. IV	42 0	112 0	32 5	77 0	19.5
No. V	42 0	67 0	50 0	64 0	19.0
No. VI	45 0	124 0	27 5	84 5	25.5
No. VII	40 0	109 5	44 0	66 0	29.5
No. VIII	48 0	108 0	34 0	76 5	17.0
No. IX	41 0	107 0	38 0	74 0	31.0
No. X	40 0	69 0	43 0	63 5	21.0
No. XI	48 0	92 0	46 5	87 0	47.0

Generally the storm tracks of the current month are to the south of those of the preceding month, and the storms which developed the greatest energy are traced from the Central Rocky Mountain region almost directly eastward over the central part of the United States. Only one disturbance was traced from the Pacific coast eastward, and this disappeared southward to the Gulf coast.

I.—The morning weather chart of the first exhibited an area of high pressure off the New England coast, where the barometer was 30.50. The barometric pressure of 29.80 was central over Manitoba, attended by east to south winds and fair weather in all districts east of the Rocky Mountains. During the 1st this depression moved rapidly to the eastward, and on the morning of the 2d it had reached the Upper Saint Lawrence Valley, inclosed by an isobar of 29.70. It passed over northern New England on the 2d, causing snow at the northern stations and dangerous northeast to northwest winds off the Middle Atlantic and New England coasts, and high winds extending to the northeast as far as Sidney. Signals were displayed at the lake stations at the close of the month and were ordered at stations on the Atlantic coast between Hatteras and Newport on the morning of the 2d.

The following maximum velocities were reported: Hatteras, 36 miles, S.W.; Delaware Breakwater, 36, SW.; New Shoreham, 32, SW.; Boston, 32, NW.; Portland, 26 N.

II.—This probably developed in the North Pacific and passed over the North Pacific coast to Montana, where it was central on the afternoon of the 2d, but not clearly defined. On the morning of the 3d it was central in Manitoba, where the barometer was 29.64—a fall of 0.54 of an inch in 24 hours. This storm developed energy during the day as its course changed from east to south of east, the center of disturbance passing over Lake Superior. After reaching the Upper Saint Lawrence valley, the course changed to the northeast, and the depression disappeared, followed by south to west gales at Farther Point, and at stations on the New England coast. The pressure diminished at the center of this area as it moved eastward, and when last observed the barometer had fallen to 29.37 at Anticosti on the afternoon of the 3d. Following this storm the temperature fell below freezing at stations in the northern portions of the United States, east of the Missouri Valley. Signals were displayed in advance of this storm at stations on the lakes and at the Atlantic coast stations north of Kittyhawk.

They were generally justified by the following maximum velocities of wind occurring during the display: Duluth, 29 miles, NW.; Escanaba, 41, N.; Milwaukee, 44, SW.; Grand Haven, 36, S.; Rochester, 39 W.; Delaware Breakwater, 37, NE.; Cape Henry, 40, NE.; Boston, 32, SW.; Eastport, 28, SW.

The wind reached a velocity of 50 miles from the south at Farther Point, when the center of the storm was near Rockliffe, and a velocity of 45 miles from the north after the center had passed to the east of that station.

The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicated the presence of this storm during its passage eastward over the ocean: On the 5th, steamship British Crown, latitude 43° 14′ N., longitude 43° 16′ W., strong gale to moderate breeze, cloudy, heavy head sea, wind north-northwest. On the 6th, latitude 40° 26′ N., longitude 47° 26′ W., moderate breeze to moderate gale, clear, winds easterly to northerly. On the sixth, steamship Britannic, latitude 45° 41′ N., longitude 38° 25′ W., barometer 29.65, wind SW., force, 7.

III.—This storm developed slowly in the Rocky Mountain regions south of Utah during the 3d and 4th, but the reports of the 2d and 3d indicate that the pressure was below the mean in the northern portions of Mexico on those dates. At midnight of the 4th the barometer was below 29.90 from El Paso northward to British America, and it was above 30.10 in the Mississippi Valley and on the Pacific coast. The direction of the wind, reported at stations in the mountain districts, indicated a general circulation of the wind about the center of low pressure, accompanied by occasional light rains. The morning weather map of the 5th exhibited a well-defined depression of 29.80 central near Cheyenne, but the afternoon of the same date indicated that the disturbance had lost energy and extended to the northward. On the morning of the 6th this storm was central in northern Iowa, apparently advancing toward the area of high barometer which then extended over the Saint Lawrence Valley and New England. The gradient increased rapidly in front of this storm, and when it was central near Saint Paul, the barometer was one inch lower than the barometer at Montreal at the same report. The course continued northeasterly during the 6th until the center reached its most northern latitude, near Lake Superior, when the course changed to the east. In passing over Wisconsin during the 6th the wind reached its maximum velocity from the south and southwest on Lake Michigan. On the afternoon of the 7th the course changed to southeasterly, the storm passing over New England and disappearing to the east of Nova Scotia. The pressure increased slowly at the center of this depression as it approached the Atlantic coast. The signals ordered as warnings for the preceding storm were continued at the lake stations in advance of this storm. When the disturbance passed over Iowa and Wisconsin, several destructive tornadoes occurred in its southeast quadrant. In Michigan, 20 miles east of East Saginaw, a tornado passed to the east, tearing down houses, trees, and fences; the track being about 40 rods in width. Near Hempstead in the same State, on the Holly and Pere Marquette Railway, a tornado passed over Kalamo township, Eaton County Michigan, destroying houses and barns and killing a large amount of stock. This is probably the same tornado that passed over Highlands the same night. Reports from Kalamazoo state that a tornado passed over the western part of that county, and then over Barry and Eaton counties, all houses, barns, and fences, being destroyed in its path, which was from 20 to 40 rods in width. Destructive winds and heavy rains also occurred in the vicinity of Keokuk, Iowa.

The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicate the presence of this storm during its passage over the ocean: On the 8th steamship British Crown, in latitude 39° 50′ N., longitude 59° 28′ W., fresh breeze to strong gale, cloudy with rain, wind NNW. to SE. On the 9th, latitude 39° 22′ N., longitude 65° 34′ W., strong gale to moderate breeze, northerly winds. On the 8th, steamship Arizona, latitude 44° 26′ longitude 44° 13′, wind NNW., force 7. On the 10th, steamship Italy, latitude 48° 50′ N., longitude 31° 56′ W., WSW. gale.

IV.—This storm developed in the Rocky Mountain region, when the preceding one was in the Lake region. During the 6th, northerly winds and snow prevailed in Idaho, Montana, Utah, and Nevada, where the barometer ranged from 30.60 to 30.80. On the morning of the 7th this storm was central in Colorado, and it moved slowly eastward during the day, followed by northerly winds and snow in Wyoming and Colorado, and was preceded by southerly winds and local rains in the Mississippi and Missouri Valleys and thence southeastward over the Gulf States. The course was to the northeast during the 8th, the center being inclosed by the isobar of 29.60. It reached the most northerly point of its course on the morning of the 9th—lat. 44°, long. 96° W. This storm followed the general course of III until it reached the Missouri Valley, and was attended by destructive tornadoes in its southern and eastern quadrants. When the center of disturbance was in eastern Colorado, a tornado occurred in Rice County, Kansas, passing in a northerly course over the town of Chase, destroying the greater part of the town. On the same date a tornado occurred at Fort Riley, Kansas, unroofing stables and causing much damage to the officers' quarters. Tornadoes occurred on the same dates in several of the Northwestern States, as this depression passed that section of the country. The area of high barometer which extended over the region north of the lakes on the 9th apparently caused this depression to change its course to the southeast, after which the lowest isobar inclosed a trough of low pressure extending from the lower Ohio Valley to the coast. Dangerous northeast winds occurred at the lake stations during the night of the ninth, and freezing weather with light snows prevailed at stations north of the Ohio River. Northeasterly gales and light snow also occurred on the New England coast as this storm passed to the southeastward, south of Cape Hatteras on the 10th.

Signals were displayed at the stations on the upper lakes on the morning of the 8th, on the lower lakes at the afternoon report of the 9th, and at stations on the Atlantic coast between Jacksonville and Cape Cod on the morning of the 10th.

The following maximum velocities indicate the energy with which this storm passed over the lake region and Atlantic coast: Hatteras, 56 miles, NE.; Kittyhawk, 51, N.; Cape May, 36; New Shoreham, 36, NE.; Duluth, 38, NE.; Milwaukee, 34, N.

V.—This depression was at no time within the limits of the stations of observation, but appeared south of Nova Scotia, moving from the South Atlantic, and was central south of Yarmouth on the morning of the 11th, when heavy snows were reported from Eastport, Halifax, and Yarmouth. This disturbance moved northward over the maritime provinces on the 11th and 12th, inclining first to the northeast and then to the northwest, until the center of disturbance was near Farther Point, where the barometer fell to 29.21. The gradient increased to the southeast from the 13th, when the depression was apparently forced to the northeast by the high area which extended over the northern districts of the United States.

The following reports, furnished through the co-operation of The New York Herald weather service, probably indicates the presence of this storm during its passage over the ocean: Steamship Rhynland, on the 17th, lat. 43° 44′ N., long. 42° 5′ W.; barometer 29.79, wind-force 10, south by west; very heavy gale and sea; gale began with wind in southeast, blew hardest from south by west, hauled slowly around to northwest and died out—sea following the wind. Steamship Celtic, on the 18th, in lat. 42° 20′ N., long. 49° 20′ W., strong gale, NNW. winds. Steamship Catalonia, on the 18th, lat. 50° N., long. 20° W., strong gale westerly winds. Steamship Wyoming, on the 18th, lat. 50° 16′ N., long 22° 21′ W., moderate to strong gale, frequent rain showers with head sea, wind northwest to southwest.

VI.—This storm passed east from the Pacific Ocean on the morning of the 9th, as a slight depression, and during the 9th and 10th moved to the southeastward over the Rocky Mountains to western Texas. After reaching southern Texas, the course changed to the east, the storm passing over the Gulf of Mexico on the 12th. A severe norther occurred at Galveston and Indianola, the wind reaching a maximum velocity of 44 and 47 miles, and the temperature falling 30 degrees. Heavy local rains occurred in the Gulf States as the center moved to the east, south of the Gulf coast, and apparently disappeared near the west coast of Florida. The norther continued in the west Gulf States until the 15th, and floods occurred in the Gulf States. At New Iberia, La., on the 12th, high northwest winds occurred, destroying houses and crops. The following report has been received from that locality: "There was a general destruction by a violent storm which came from the northwest on the night of the 12th. * * * Houses were torn to pieces, and fences, provisions, forage, furniture, and everything previously saved from the floods were destroyed. In Iberia Parish, Louisiana, at least 1,500 persons were left homeless and without means of support and shelter. The situation is appalling. The height of the flood above tide-water was nearly 17 feet. The east side of the Teche, from Loranville to Pattersonville, 100 miles in a straight line north and south, is a lake extending from west to east to the high ridges of Bayou La Fourche, 50 miles wide."

Another report says: "The wind, which on Wednesday, all day and night, blew strongly from the southeast along the coast of Louisiana, drove the waves from the Gulf into Berwick's Bay, and the vast expanse of water covered the country for fifty miles east and west, from the ridge of La Fourche to the hills west of the Teche and for a hundred miles north and south. The water was thus piled up at Morgan City 4.6 above the flood of 1874, and very considerably above the highest flood-level ever attained before by the waters of the Atchafalaya. Houses were wrecked and damaged, and places never before inundated in the knowledge of the oldest inhabitant, were now covered with water."

VII.—This was central in Utah on the 16th, passing southward to the northern part of New Mexico, and northeastward over Colorado and Nebraska, with increasing energy, causing heavy rains or snows in the Missouri Valley and high southerly winds in Texas, Arkansas, Missouri, and Kansas. At 4 o'clock in the afternoon of the 18th, when the depression was central near Yankton, one of the most destructive tornadoes occurred at Brownsville, Mo. An observer reports as follows: "A few moments before 4 o'clock a light wind began blowing, accompanied by light rain. Almost immediately the atmosphere became heavy and close. Two large bluish-colored clouds appeared, one in the south and the other in the southwest; these clouds were apparently several miles distant, and seemed to be approaching each other with great velocity. When within about two miles of the town the two clouds united and, immediately after, a loud roaring noise was heard similar to the distant rumble of a locomotive. The noise increased as the storm approached the town. Before the clouds united each moved over an irregular and reeling course, but after they united the cloud assumed the shape of a large funnel, the mouth hanging close to the ground. The storm-cloud moved forward in a zigzag motion with great velocity, and scarcely five minutes elapsed from the time the first cloud was seen until the town was destroyed."

Less destructive tornadoes occurred on the same date in Illinois and Iowa. After reaching northwestern Iowa, this depression inclined slightly to the southeast, and then moved to northeast over Michigan, Saint Lawrence Valley, and New England, and then disappeared to the eastward of Nova Scotia on the 21st.

The following reports, furnished through the co-operation of The New York Herald Weather Service, probably indicate the presence of this storm over the ocean: On the 22d, steamship Catalonia, lat. 46° 22′ N., long. 40° 11′ W., moderate gale, hazy. On same date, steamship Wyoming, lat. 45° 15′ N., long. 41° 46′ W., moderate gale and hail-squalls. On the 23d, lat. 43° 43′ N., long. 46° 32′ W., fresh gale with head sea; on the 22d, steamship Nevada, lat. 41° 36′ N., long. 62° 30′ W., moderate gale; on the 25th, steamship Britannic, lat. 40° 08′ N., long. 37° 84′ W., strong westerly wind and high head sea. This storm developed its greatest energy while passing over the Lake region, the wind reaching a maximum velocity of 44 miles, SW., at Sandusky; 44, NW., at Grand Haven; 41, W., at Rochester; and 42, SW., at Buffalo. There was a destructive tornado at Pennsville, Pa., occurring about 4 o'clock in the afternoon on Wednesday, the 19th.

VIII.—This depression developed in the Upper Missouri Valley on the night of the 19th and moved southward to western Kansas, where it was central at midnight of the following day. It moved slowly to the eastward during the 21st and 22d causing heavy rains in all districts south of the Lake region, and dangerous northeast gales at stations on the lakes. When central near Cairo, severe local storms occurred in the Gulf States. This depression passed to the eastward over Kentucky and North Carolina on the 23d, and disappeared to the southeastward off the South Atlantic coast, attended by strong northeasterly gales at stations north of Charleston. On Saturday, the 22d, a violent tornado occurred in Pender and Brunswick Counties, North Carolina. The storm moved in a northerly direction across the Cape Fear River, making a perfect lane through the woods and fields, the tract being about 200 yards in width. Tornadoes also occurred in Bibb County, Georgia, and Dallas County, Alabama, on the afternoon of the same date.

IX.—This storm was first observed in Colorado at midnight of the 24th, and moved directly eastward during the 25th and 26th, passing over the central part of the United States, and leaving the Middle Atlantic coast on the 27th. When the course changed to the northeast, this storm followed the general direction of the coast line, developing considerable energy, and disappearing to the eastward of Nova Scotia on the 28th. On the 28th, steamship Britannic, lat. 41° 55′ N., long. 60° 7′ W., barometer 29.86, wind south, force 7.

X.—This was a slight depression which appeared off the New England coast on the 30th, apparently moving to the northeast, but the center was at no time within the limits of the Signal Service stations.

XI.—Advanced from British America on the last day of the month and was central over Lake Superior at the close of the month, as a slight barometric disturbance.

INTERNATIONAL METEOROLOGY.

International Charts IV and V accompany the present number of this Review. Chart IV is published for February, 1880, and continues the series of that chart, begun in January, 1877. Chart V is prepared for May, 1880, and continues the series of that chart from November, 1877. In the preparation of these charts, which are based upon the daily charts accompanying the International Bulletin of the months of February and May, 1880, much valuable information has been obtained from the Monatliche Uebersicht der Witterung für February and May, published under the direction of Prof. Dr. G. Neumayer, director of the German Marine Observatory, and from the Bulletin Mensuel, published by Mr. Marc Dechrevens, of Zi-Ka-Wei, China. Chart IV exhibits the mean pressure, the mean temperature, and the prevailing direction of the wind over the northern hemisphere for the month of February, 1880, as determined from one observation every day taken at 7.35 a. m., or 0.43 p. m., Greenwich mean time.

The most marked area of low barometer extends over the the north Atlantic Ocean between the British Isles and Greenland, and is central near Stykkisholm, where the mean pressure for the month was 29.28, and the prevailing wind was southwest, force 5.

The barometric gradient increases rapidly to the southeast and west, and very slowly in a northeasterly direction, indicating an extension of low area over the Artic regions.

The second area of mean low barometer is central over British India, where, in the southern part of Hindostan, the mean pressure for the month was below 29.90.

Four areas of barometric maxima appear upon the chart, the most marked of which extends over eastern Siberia, where the greatest mean pressure was 30.68. This area included within its limit the eastern half of Asia. Passing to the westward, a second area inclosed by an isobar of 30.20 is marked as extending over southern Russia, from the Black to the Caspian Sea. In this region, the pressure diminishes rapidly toward the Arctic Ocean, and at the northern stations of Europe ranges from 29.50 to 29.80.

The third area of high barometer is central in British America near York Factory, where the average pressure for the month is 30.22. The area of high barometer usually extending over the Atlantic has moved to the westward, and includes within its limits the eastern Gulf States, the isobar of 30.20 being closed and extending from the 68th to the 88th meridian. The high area of the Pacific extends over the North Pacific coast, where the pressure ranges from 30.15 to 30.27 and increases with the latitude.

Compared with the preceding month the area of low barometer in the Arctic region, central west of Iceland, has moved apparently to the eastward, the region of least pressure being now near but northeast of Iceland, where the barometer is .3 of an inch below the mean of the previous month. The pressure has also diminished in the western part of this low area, the mean at Godthaab being 29.42 or .17 of an inch below the mean of January.

In the eastern part of Asia, the region of greatest pressure, the barometer has averaged .1 of an inch below the mean for the previous month.

In North America the pressure has increased .2 of an inch near the center of the continent. The area of 30.20, which extended over the southern portion of the Middle States, has moved to the southward over the eastern Gulf States, and the isobar of 30.10 has moved westward to Texas and southward from New England to Pennsylvania. The pressure has changed slightly in the Lake region. In the region between the Upper Mississippi and Missouri Rivers, the barometer is .1 of an inch below the mean, while at the Rocky Mountain stations it remains near the normal.

The most marked change in the distribution of pressure occurred on the Pacific coast, the high area which was apparently to the west of the coast line during January having moved to the northeast over Oregon, replacing the low area of 29.90 by a general increase of pressure along the coast as far south as San Diego.

Compared with the corresponding months of previous years, the pressure was above the normal on the Atlantic, Pacific, and Gulf coasts, and slightly below in the central part of the United States. In the central part of British America the pressure has averaged .24 of an inch above the mean.

The following table exhibits the mean pressure and the mean temperature for the month of February, 1880, in the several countries of Europe and Asia, compared with the means as determined from the observations taken during February in the years 1877, 1878, and 1879:

Countries.	Mean barometer.		Mean temperature.	
	February, 1877-'78-'79.	February, 1880.	February, 1877-'78-'79.	February, 1880.
Algiers	30.16	30.11	58.6	59.5
Austria	29.94	30.11	39.6	33.1
British Isles	29.83	29.65	41.9	46.0
Denmark	29.78	29.79	33.5	35.8
France	30.03	30.01	47.9	43.1
Germany	29.89	29.98	37.6	36.1
India	29.96	29.93	74.9	71.3
Italy	30.00	30.06	51.4	50.5
Norway	29.63	29.57	30.5	36.5
Portugal	30.22	30.14	54.8	54.7
Russia	29.93	30.10	27.7	22.2
Spain	30.11	30.09	54.7	55.3
Sweden	29.70	29.74	23.6	29.3
Turkey	30.04	30.10	52.4	50.3

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of February, 1880, as compared with the means of three years:

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.		
	February, 1877-'78-'79.	February, 1880.	Departure.	February, 1877-'78-'79.	February, 1880.	Departure.
	°	°	°	.		
York Factory	—19.2	—28.8	— 9.6	29.98	30.22	+0.24
Godthaab	16.3	7.0	— 9.3	29.52	29.42	—0.10
Stykkisholm	32.6	28.9	— 3.7	29.51	29.28	—0.23
Tromso	25.0	36.5	+11.5	29.46	29.43	—0.03
Thorshavn	39.0	41.0	+ 2.0	29.60	29.36	—0.24
Archangel	8.1	15.8	+ 7.7	29.72	29.75	+0.03
Ekaterinburg	11.0	8.1	— 2.9	30.04	29.93	—0.11
Barnaul	4.2	5.9	+ 1.7	30.37	30.17	—0.20
Yeniseisk	1.2	1.0	— 0.2	30.29	30.25	—0.04
Nikolaievsk on the Amoor	— 4.7	—11.7	— 7.0	....	....	....
Zi-Ka-Wei	37.7	39.2	+ 1.5	30.33	30.30	—0.03
Pekin	28.2	26.8	— 1.4	30.33	30.42	+0.09
Beirut	61.8	59.9	— 1.9	30.07	30.02	—0.05
Mauritius	81.7	80.2	— 1.5	29.89	29.97	+0.08
Fort Napier	78.8	75.2	— 3.6	29.84	29.80	—0.04
Paramaribo	80.3	77.8	— 2.5	30.03	30.00	—0.03
Funchal	63.8	64.9	+ 1.1	30.28	30.12	—0.16
Ponta Delgado	61.0	59.2	— 1.8	30.23	30.11	—0.12
Bridgetown	80.4	77.5	— 2.9	30.00	30.00	Normal.
Navassa	78.1	75.2	— 2.9	....	....	....
Melbourne	64.1	68.4	+ 4.3	30.01	30.03	+0.02
Hobart Town	63.6	67.3	+ 3.7	29.84	30.03	+0.19
Astrakhan	29.4	17.6	—11.0	30.06	30.25	+0.19
Athens	55.9	53.3	— 2.7	30.02	30.10	+0.08
Tiflis	45.2	39.0	— 6.2	30.07	30.20	+0.13
Laghauat	58.3	59.4	+ 1.1	30.19	30.16	—0.03
Fort de France	76.9	74.5	— 2.4	29.92	30.06	+0.14
Lisbon	55.2	55.8	+ 0.6	30.23	30.14	—0.09
Sandwick Manse	40.0	42.5	+ 2.5	29.69	29.49	—0.20
Malta	58.4	60.0	+ 1.6	30.05	29.90	—0.06
Madrid	49.5	50.5	+ 1.0	....	....	....
Gibraltar	60.4	58.5	— 1.9	30.19	30.08	—0.11
Tashkend	40.3	24.6	—15.7	30.34	30.35	+0.01
Cape Town	78.8	78.2	— 0.6	30.02	29.98	—0.04
Free Town	87.2	86.4	— 0.8	29.83	29.86	+0.03
Angra	58.2	55.9	— 2.3	30.17	30.10	—0.07
Cagliari	56.3	57.0	+ 0.7	30.00	30.01	+0.01

The temperature continued above the normal in the eastern part of North America. The reports show that this was the warmest February that has occurred in many years, especially in the United States east of the 100th meridian. At the Rocky Mountain stations the temperature remained about stationary, and on the Pacific coast it ranged from 2° to 6° below the normal. It averaged more than 6° above the mean of February from Virginia northward to the Saint Lawerence Valley, and from New York westward to Michigan.

The following are some of the extreme monthly temperatures reported at isolated stations: Lowest—York Factory, —28°.8; Nikolaievsk on the Amoor, —11°.7; Yeniseisk, +1°; Barnaul, 5°.9; Godthaab, 7°.0. Highest—Freetown, 86°.4; Mauritius, 82°; Cape Town, 78°.2; Bridgetown, 77°.5; Paramaribo, 77°.8.

The prevailing direction of the wind over North America was northeasterly on the east coast of the Gulf of Mexico and in southern California; southerly in the Mississippi and Ohio Valleys, the Lake region, North Pacific coast, and over the Plateau regions; northwesterly at stations on the eastern slope of the Rocky Mountains and in the Missouri Valley; westerly in Canada and the maritime provinces; variable in the central part of Mexico. Over the Atlantic, south of latitude 30°, northeasterly; north of latitude 30° and east of longitude 30°, southwesterly, and west of longitude 30°, northwesterly.

In Europe, north of the 45th parallel of latitude, the prevailing winds were from south to West; south of that parallel, at stations on the Mediterranean, they were from northeast to northwest. Westerly winds prevailed in Algiers and in Hindostan, and northerly winds are reported generally from China and Japan.

The following notes and extracts, descriptive of the meteorological conditions over Europe and the north Atlantic for February, 1880, are taken from the Monatlich Uebersicht der Witterung: In a meteorological sense, February was more eventful than the two preceding months; for the better description of the weather conditions the month is divided into three periods, viz, from the 1st to the 8th, 8th to 19th, 19th to 28th.

The first period may be considered as a continuation of the last decade of January. In the southeastern part of central Europe, from eastern Germany to the Black Sea, an area of high barometer (30.32 to 30.71) prevailed, while to the north of this region four barometric depressions occurred, moving in a direction west to east. The atmospheric disturbances in central Europe were very slight; there was almost a total absence of precipitation, and heavy frosts continued uninterruptedly. In Bavaria and Wurtemburg the frost reached its greatest intensity, minimum temperatures of +5° to —0°.4 (Fahr.) being reported from these sections.

The following notes are of interest: "Carlsruhe, February 8.—The duration of cold of the present winter surpasses that of 1829–'30." A dispatch from Rorschach, dated February 7th, stated that Lake Constance froze over the night before; temperature +14° (Fahr.) In the year 1830, on the 2d of February, the lake froze over and navigation was interrupted. In Italy the winter was very severe; in Venice water froze in cisterns, causing a scarcity of drinking-water; in Naples frost and snow prevailed. About the end of the period under consideration, two depressions appeared in northwestern Europe and extended far southward. During the second period the region of barometric depressions was transferred from the north to the west of Europe. The area of high pressure continued until the 10th northwest of the Black Sea. It then moved slowly to the north, and about the 18th was central as an area of unusually high pressure (30.71 to 30.91) in northeastern Russia.

Several slight depressions occurred in southern Europe, causing changes in wind, and accompanied by rain, and in some cases snow. The severe frosts which occurred in southern and western Europe during the two previous months were followed by warmer weather, and the region of greatest cold was transferred to central and northern Russia during the second period of February.

In the greater part of Germany, from the 16th to the 19th, the temperature rose with southeasterly winds, while at Memel, with east and southeast winds, quite the contrary took place. At Memel, during the 18th and 19th, the minimum temperature occurred, while in western Germany, the maximum was reached on the 19th.

During the third period (20th to the end of month) several depressions of great energy passed over northwestern Europe moving eastward. On the 24th the area of high barometer extended from the British Isles to central Russia, so that in the whole of middle and southern Europe, as far south as the Mediterranean, fresh easterly and northerly winds prevailed, by which the temperature of this region was considerably lowered. This area of high barometer was subsequently driven first to the south, then to the southwest of the continent, where it remained until the end of the month. Over the north Atlantic, west of the 50th meridian, during the first decade of the month the barometer was high and fair weather with northwesterly winds prevailed with few interruptions of falling barometer and southwesterly winds, heavy rains occurring when the direction of the wind changed; 3d, in 42° N., 65° W., SW. wind, force 10, torrents of rain, followed by clear weather; 9th, in 39° N., 66° W., NNW. wind, force 10; 10th, in 43° N., 53° W., WSW. to NW. wind, force 8–10. From the 10th to the 20th in this part of the Atlantic the winds were variable, chiefly from SW. to NW., and the barometer ranged from 29.50 to 30.32; 11th, in 41° N., 61° W., NW., force 10; 13th, in 40° N., 56° W., SW., force 10; 14th, in 41° N., 51° W., WSW., force 9; 16th, in 41° N., 59° W., NW., force 8, rain and hail squalls. From the 20th to the end of the month calm and fair weather, moderately high barometer and easterly winds prevailed.

The following vessel reports indicate the occurrence of storms on the middle Atlantic, on the dates named: 1st, in 47° N. 37° W., SW., force 8; 5th, in 48° N. 30° W., SW., force 10; 6th, in 47° N. 35° W., WNW., force 10; 7th, in 41° N. 38° W., NW., force 10; 8th, in 43° N. 34° W., W., force 9; 10th, in 48° N. 33° W., WNW., force 10, thunder, rain, and hail squalls; same date in 46° N. 45° W., W., force 11–12, hail and snow; 16th, in 46° N. 46° W., hurricane-like SE. storm, and torrent of rain, barometer 28.62. 16th to 18th, in 43° N. 40° W., SSW., 10 by W. 11 to N. 10, hurricane squalls with rain, hail, and lightning; 23d, in 44° N. 45° W., SSE., force 8.

The following vessel reports indicate the occurrence of storms over the ocean east of the thirtieth meridian, or west of the European coast, during the month: 6th, in 46° N., 28° W., NW., force 8, squally; 8th, in 50° N., 12° W., S. to NE., force 8; 9th, in 49° N., 8° W., W., force 11, squally, barometer 28.54; 10th, in 43° N., 26° W., NW., force 10; 13th, in 47° N., 28° W., WNW., force 12, hurricane, hail and rain, lightning all around, high sea; 16th, 48° N., 6° W., WSW., force 11, hard squalls, heavy rain, barometer 28.78.

Chart V exhibits the tracks of barometric depressions which have been traced from the daily international charts for the month of May, 1880, supplemented by vessel reports from the North Atlantic and North Pacific. The data received is charted for each day of the month on the charts accompanying the International Bulletin for each day, and from these charts and additional reports the movements of the centers of barometric minima are traced.

Twenty-five of the principal storm-areas occurring in the northern hemisphere have thus been traced on the daily charts. Concerning the general distribution of these barometric disturbances, the following is given: Nine passed over parts of the United States and Canada. Three of these were first observed on the Pacific coast west of Oregon. One approached the stations of observation from the Gulf of Mexico south of 25th parallel. The general movement of the storms occurring in North America was to the northeast. Four of these depressions have been traced over the Atlantic, but in only two cases were sufficient vessel reports received to warrant the tracing of a continuous storm from North America across the Atlantic. Two regions of barometric disturbance are exhibited over Europe, one extending from east to west from the North sea to northern Russia; the other extending along the north coast of the Mediterranean. The region of barometric disturbance in eastern Asia extends from the coast of China northeastward to the island of Yesso, the mean track of the low-areas passing to the west of Japan and south of Corea.

The following brief description is given of the storms first appearing within the limits of the Signal Service stations:

I.—On the 2d and 3d of the month, the barometer was high on the Atlantic coast and a depression was central on the eastern slope of the Rocky mountains. The circulation of the winds in the southern sections of the United States and the gradual fall of the barometer along the coast of the Gulf of Mexico indicated the advance of a disturbance from the south or southwest. On the 3d, this area apparently moved in an easterly direction over the Gulf of Mexico, passing over Florida, between Punta Rassa and Cedar Keys during the night. On the 4th, the course changed to the northeast and the center of disturbance passed to the east of, and parallel to, the South Atlantic coast. The morning report of the 5th showed the center to be near Cape Hatteras, moving to the northeast, and later reports received from vessels enable us to trace the center to the southern point of Nova Scotia, where it was central on the 6th as a storm of great energy. The following maximum velocities of wind at stations near the center of disturbance indicate the severity of this storm: Charleston, NE., 25 miles; Macon, North Carolina, SE., 32 miles; Cape Lookout, SE., 40 miles; Hatteras, SE., 47 miles; Kittyhawk, NE., 38 miles; Chincoteague, NE., 39 miles; Eastport, N., 27 miles. The following marine reports were of service in determining the track: Brig Sisters at New York, May 9th, reports heavy SE. gale on May 4th, lasting ten hours. Ship Niagara, May 5th, off Hatteras, stove bulkwarks, etc., during NE. gale. Barque Windermere at New York, May 7th, from Colombo, January 31st, reports, on May 5th, had revolving hurricane, lasting seven hours. Brig Edith Hall at New York, May 10th, from Bahia, reports, May 5th, terrific SE. gale and tremendous sea. Bark Elinor in 37° N., 70° W., May 6th, hurricane from NE. to SW., lasting twenty-four hours, during which the vessel lost her top-mast.

A slight depression developed in British America on the 4th and passed southeastward over the Saint Lawrence Valley on the 5th, apparently uniting with this storm, when the center of disturbance was near Yarmouth on the morning of the 6th. The chart of the 7th showed a fall of .55 of an inch in the barometer at Saint John's, and the following report, from the same station, showed a rise of .16 of an inch, with west wind. The following reports from vessels in the north Atlantic are interesting in connection with the study of this storm: May 5th, lat. 42° 10′ N., long. 56° 35′ W., steamship Crown, S. W. gale with heavy sea for twelve hours. May 7th, lat. 41° 34° N., long. 58° 48′ W., steamship Baltic, SSW., force 8 to 9, violent gale, high southwesterly sea. In 41° N., 66° W., SW., W., and NW., strong gale, high sea. May 8th, steamship Nederland passed through this storm in lat. 43° N., long. 42° W., barometer 29.86, SW., force 4, high SSW. sea; on the 9th, the same vessel reports in 41° N., 47° W., barometer 30.19, temperature 46°, a fall of 16°, wind NNW. showing the advance of an area of high pressure to the westward of this storm. The indications are that that this storm passed to the eastward over the Atlantic, but the reports are not sufficient to warrant the charting of its continuous course. It disappeared to the east of Nova Scotia on the 8th, followed by a rapid increase of pressure at stations on the Atlantic coast.

II.—This storm approached the Pacific coast from the west on the 4th, where a sudden fall in the barometer was reported from stations in Washington Territory and Oregon, the pressure at Roseburgh and Portland being .42 of an inch below the mean pressure for the month. On the 5th the area moved rapidly to the eastward, crossing the Rocky Mountains a little to the north of the boundary line, the pressure ranging from .63 to .65

of an inch below the mean at Forts Stevenson and Buford. On the 6th the course changed to the southeast, and the center of the depression passed over Iowa with loss of energy and increasing pressure at the center. On the 6th, the barometer was 29.41 at Omaha, and on the following morning the center was near Des Moines, after which its course changed to the northeast, the storm passing over Wisconsin, Lake Superior, and thence towards the southern portion of Hudson's Bay. South to southeast gales occurred on Lakes Michigan, Erie, and Huron, as the depression passed to the northeast; maximum velocities of wind ranged from 30 to 36 miles per hour. Several disasters occurred on the North Pacific coast when this disturbance was central near Portland. This disturbance appeared to the northeast of the coast of Labrador on the 8th, and was followed by a second depression, which extended from British America southward to Texas, this last separating two areas of high barometer, one central in the Saint Lawrence Valley and the other over the Pacific coast, west of California.

III.—This developed in the Rocky Mountain regions on the 8th and passed over Minnesota and Lake Superior on the 9th, attended by heavy rains as far south as the Ohio Valley. The course changed to the north near Duluth, and on the morning of the 10th the center was near Moose Factory, where the pressure was 29.58, wind SW. Gales occurred on the 9th, the storm-center becoming unusually well-defined, enclosed by an isobar of 29.40 as it passed over this region. After reaching the 56th parallel of latitude, the course changed to the east and then to the southeast, the center passing over the Gulf of Saint Lawrence on the morning of the 12th, attended by violent gales in the Canadian maritime provinces. On the 13th it was central in lat. 49° N., long. 59° W., where the barometer fell to 29.58, with high N. to NE. winds; high north winds were also reported on the same date on the Atlantic coast between Halifax and Hatteras; northwest gales were also reported on the 14th in 41° N., 68° W. In 37° 30′ N., 56° 00′ W. hurricane, very heavy sea; lost topmasts. In 36° N., 68° W., May 15th, ship Wattikka, severe gale from SE. In 36° N., 64° W., schooner Eider, May 15th, severe gale. On the same date, in 30° N., 60° 30′ W., schooner Lewis, 29.85, SSW., high; heavy sea and threatening. On the 16th, in 50° N., 40° W., Altmore, SSW. gale for twenty-four hours; decks swept. In 56° 23′ N., 28° 55′ W., SW. hurricane; tremendous sea. In 40° N., 44° W., Castelar, SSW. hurricane for six hours; in 42° 20′ N., 48° 00′ W., Kroenen, severe gale, SSW. On the 17th, in 44° N., 45° W., steamship Celtic, W., strong gale; in 42° N., 48° W., steamship Vaderland, WSW., moderate gale, cloudy, high sea. The above reports, considered in connection with the regular simultaneous reports, enable us to trace this depression over the North Atlantic Ocean to Iceland, and thence eastward to the northern coast of Norway.

IV.—The barometer fell rapidly at stations on the Pacific coast on the 10th as this depression approached from the west, accompanied by heavy rains as far south as San Francisco, and light rains to San Diego. On the 11th, when the center of disturbance was near the coast line, the pressure was .53 of an inch below the mean at Portland. This storm, although severe when first observed, passed rapidly over the Rocky Mountains on the 13th and 14th, losing much of its energy and finally disappearing before reaching the Mississippi Valley.

V.—This storm developed in the upper Missouri Valley on the 16th and passed slowly over Dakota on the 17th, the barometer falling to 29.40 at Breckenridge. On the 18th it moved eastward over Lake Superior and continued its easterly course during the 19th and 20th, losing much of its energy and finally disappearing northeast of Quebec.

VI.—This developed in Texas on the 20th, and moved slowly over Indian Territory and the lower Ohio Valley, causing rains in the Southern States. On the 21st this storm was central near Cairo, from which point it moved to the north, developing energy as the center of disturbance passed over Lake Huron. On the morning of the 23d the disturbance had reached the southern part of Hudson's Bay, the barometer at Moose Factory reading 29.68, a fall of .42 of an inch in twenty-four hours.

VII.—This was first observed on the Pacific coast on the 23d, central west of Victoria. The barometer fell rapidly at stations on the north Pacific coast on that date, as the center passed rapidly over the coast range and thence eastward to Manitoba, where it is central on the 24th, the barometer being .62 of an inch below the mean for the month. This depression probably united with VIII, which developed on the eastern slope of the Rocky Mountains.

VIII.—This storm was central in Nebraska on the 24th, where the pressure was .34 of an inch below the normal. On the 26th, the center of disturbance had passed eastward over Lake Superior and beyond the stations of observation. Heavy rains occurred in the northern quadrants of this storm, but the most noticeable feature was the high temperature attending the south winds in the Mississippi and Ohio Valleys. This warm wave gradually extended over States east of the Mississippi, causing unusually warm weather for May; rains were light in the southern quadrants of the storm, until the wind shifted to the west and northwest.

IX.—On the 29th, the barometer fell in Texas and the adjoining States, accompanied by light rains northward to Missouri. On the 30th, the storm, thus developed, increased in energy as it advanced to the northeast over Lakes Michigan and Huron. The pressure was .5 of an inch below the mean at stations near the center of disturbance, and the rain area included that portion of the United States east of the Mississippi. The following maximum wind velocities occurred on the northern lakes: Michigan, 28 miles, NW.; Ontario, 26 miles, W. On the 31st, this storm moved beyond the limits of the stations of observation. Dangerous SE. to SW. winds occurred on the Atlantic Coast, maximum velocities being 36 miles SE. at Chincoteague, Delaware Breakwater, 34 miles S., and Wood's Holl, 40 miles SW.

Of the storms occurring on the European coasts the following brief description is given:

X.—On the morning of the 5th the pressure was high over the British Isles, accompanied by high northerly winds, and a second area of high pressure extended over southeastern Russia. This depression apparently passed to the southward from the Arctic Ocean during the night of the 5th, and was central on the morning of the 6th near Hernosand, where the barometer had fallen .36 of an inch in the past twenty-four hours, the isobar 29.60 inclosing the stations in the northern and central portions of Sweden and Norway, where the winds were light and variable. The pressure increased rapidly in a southwesterly direction and violent northerly gales occurred at stations on the northeast coast of Scotland, in the North Sea, and in the English Channel on the 6th. The morning report of the 7th placed the center of disturbance near St. Petersburg, with northerly winds prevailing over western Europe, the force of wind being increased by a second depression which was moving to the east over Italy.

During the 8th and 9th this storm moved to the northeast and passed beyond the stations of observation. The area of high barometer, which was then south of it, apparently following its general course with increasing pressure.

XI apparently developed off the coast of Portugal on the 4th, and moved slowly over the Mediterranean on the 5th, 6th, 7th, and 8th, inclining to the southward during the 7th, after which the course changed slightly to the north of east, passing over the northern portion of Italy and thence eastward to the region of the Black Sea, inclosed by an isobar of 29.60. It was last observed as central near Lemberg, and disappeared over western Asia, probably uniting with an extensive area of low barometer then central in India.

XII was central southwest of Ireland on the 8th, and moved to the southeastward over the Bay of Biscay and southern France, from the 9th to the 12th; ship Hypolyta reported on the 8th in 49° N., 15° W., 8 p. m., strong NE. gale, force 11, high cross-sea; midnight, 8th and 9th, gale moderating. This depression continued its easterly course over Europe until the morning of the 14th, when its course changed to the northeast, and during the 16th, 17th, and 18th it passed over central Russia, and finally disappeared near longitude 50° E.

XIII.—Vessel-reports from mid-ocean on the 12th and 13th, indicate the presence of this storm in that locality. U. S. ship Saratoga, near the Azores, recorded the following low pressures: 12th, in 39° N., 24° W., 29.43, heavy rain, squally; 13th, in 39° N., 20° W., 29.49, WSW., force 7; on the 14th, easterly winds on the northern margin of this storm increased in force. Steamship Indiana, in 51° N., 15° W., reports SSE., force 8, barometer 29.89. On the 16th the barometer at Madeira read 29.61. On the 17th, bark Lizzie Wright, in 46° N., 14° W., reports S. gale, lasting twenty hours. From the 17th to the 20th this area increased in energy as it passed to the eastward over the north coasts of the Mediterranean, disappearing near the Black Sea on the 20th.

XIV.—This storm probably developed in the Atlantic west of Algeria, and passed northeastward as a slight depression, reaching northern Italy on the 18th, where the pressure was 29.69 on the morning of that date; strong northwesterly winds prevailed in the western part of the Mediterranean on the 18th, and brisk to high southwest winds were reported on the same date at stations on the south coasts of the Mediterranean. An area of high barometer extended over the British Isles and thence eastward to Russia, with northerly winds prevailing in Europe from the coast of France eastward to the low area, which was then central in western Siberia. This area passed to the eastward over Turkey on the 19th, and was central in southern Russia on the 20th as a slight disturbance, and on the morning of the 21st it had moved to the region of the Caspian Sea inclosed by an isobar of 29.60. The chart of the following day indicated that a small but well-defined depression was central northeast of the Caspian Sea, and reports from that region indicate that this was a continuation of XIV.

XV and XVI were low areas which apparently developed in the North Sea on the 20th and 22d, respectively, and each passed to the northeast over the Baltic region and disappeared on the day following.

During the transit of this minor depression, an extensive area of low barometer existed in the Arctic region, north of Europe; the pressure being below 29.40 at northern stations on the 22d, below 29.30 on the 23d, and below 29.00 on the 24th, accompanied by violent SW. gales,

XVII.—This storm was probably central as a severe storm south of Iceland on the 23d. Steamship Britannic, in 51° N., 23° W., reported barometer 29.87, wind W., force 7, rain and heavy west northwest swell. Other vessel-reports from this locality indicate the presence of a severe storm to the northeast of or near the coast of Ireland.

On the 24th, this storm had reached the coast of Norway, inclosed by an isobar of 29.00. The following reports from stations within the influence of this storm show the gradient in southern portions of the depression: Brono, 28.94; Christiana, 29.13; Copenhagen, 29.60; Hamburg, 29.81. After reaching the Continent the course changed to the south of east and so continuing during its transit over Europe on the 25th, 26th, and 27th, with rising barometer at the center of the depression. It was last observed in eastern Russia as an extended area of 29.80.

XVIII.—This depression was apparently a secondary disturbance, attending a decided depression which extended over the Arctic regions north of the British Isles, on the 27th and 28th. The general direction and force of wind on the north coast of Europe indicated the presence of a depression of great energy in the higher latitude, and the chart of the 28th exhibits a low area to the northeast of Europe, and a well-defined area of high pressure advancing from the Atlantic, thus increasing the gradient and causing high NW. winds at stations in western and northern Europe. This depression moved to the northeast over northern Russia on the 29th, and was followed by the high area from the Atlantic, which may be traced on the daily charts from the Azores on the 26th to northern Europe, where it appeared immediately to the west of this depression.

The following general description of the barometric depressions traced along the coasts of China and Japan during the month of May, 1880, is taken from the Bulletin Mensuel, published by Mr. Marc Dechrevens, of the Zi-Ka-Wei Observatory. The storm-tracks are so traced as to indicate the approximate location of the center of each disturbance at the hour corresponding to 7.35 a. m., Washington mean time.

XIX.—This depression advanced from the interior of China on the 5th, passing a little to the south of Shanghai, and after leaving the coast, curved to the northeast, following the south coast of Japan, and disappeared to the northeast of the island of Nipon, about latitude 40°. This storm was central over Wuhu, China, at 10 a. m. of the 5th, and on the evening of the 7th was north of Nipon, having advanced with an average velocity of 38 miles per hour. This storm was immediately followed by a second depression which moved to the eastward over the ocean, and was felt as far south as Hong-Kong. Light rains are reported in China, and abundant rains in Japan near the center of disturbance. The barometer fell .5 of an inch at Tomangasima light-house (lat. 34° 18′ N., long. 135° 0′ E.) where the wind blew violently from the west. At Tokio, the rainfall during the 6th and 7th was 3.26 inches.

XX.—This depression crossed the Gulf of Pe-Chi-Li on the 8th, moving from west to east; it passed over Corea on the 9th, and over Japan on the 10th and 11th. Lowest barometer was observed at Tien-sin, at noon of the 8th, and at Tokio at 8 p. m. of the 10th. Heavy rains occurred near the coast on the 9th. The storm was severe near the center of depression, but the disturbance did not extend to the southern stations.

XXI.—This storm moved to the eastward over China from the WSW. to ENE., passing over Hankow (wind S. to NE.) at noon of the 11th. It passed over Wuhu about 5 p. m. of the 11th, winds SE. to W. and NW. At Zi-Ka-Wei (wind SSE. to WNW. and N.) from 5 p. m. to midnight, barometer low and stationary. At 1 a. m., on the 12th, the storm increased in force and continued with great violence until 5 a. m., barometer rising rapidly, the wind remained SSE. until midnight, when it veered to the SSW. and then to the NE. during the day. At 9 p. m. the winds to the north of China and Japan indicated clearly the presence of a cyclonic disturbance in the Straits of Corea, which soon disappeared. The lowest barometer was observed at Tokio at 5 p. m. on the 13th, when the center of disturbance was over the Sea of Japan.

XXII.—The storm approached from the southwest of China, passing over Hankow, Wei-hu, Nankin, and to the north of Zi-Ka-Wei. The depression was slight and of irregular form, although violent northerly winds were reported from Hankow on the 20th. Light rain occurred at Zi-Ka-Wei on the evening of the 20th.

The depression reached Japan on the evening of the 20th. On the 21st, about noon, it passed to northwest of the light-house of Tsurisima, and on the 23d to the northwest of the light-house of Kinkasan. The lowest barometer at Tokio, 29.71, occurred at 3.30 p. m., on the 22d, with a moderate wind from the SSE. Light rains only occurred during the passage of this depression.

XXIII.—This depression followed XXII, advancing from channel of Formosa, where it was central on the 20th, and passing to the northward, it reached the straits of Corea on the 23d, and was over the Sea of Japan on the 24th. At Tokao, on the west coast of

Formosa, 5.70 inches of rain fell on the 20th. This storm was central over the island of Yesso on the 25th.

XXIV.—Violent whirlwinds were reported from the northern provinces of China on the 25th and 26th, while this depression was central near Pekin, toward the southwest. The Pekin Gazette gives an interesting detail in its issue of the 9th of July, relative to the hail-storms of the 26th of May, which were very destructive in the districts of Honau-fau (lat. 34° 30′ N., long. 112° 30′ E.) The reports show that the hail commenced at 4 p. m., and was of only short duration; the crops in several of the cereal districts were cut to pieces and destroyed.

XXV.—This was the most severe storm occurring during the month in the central parts of China. In addition to the regular reports from meteorological stations on the coasts of China and Japan, a number of marine reports have been received from vessels which encountered this storm after it left the coast. It first appeared as central southwest of Hankow on May 29th, passing to the south of that city about 4 p. m. (winds SE.–N.) it moved along between Hankow and Wuhu, passing the latter station at 4 a. m. on the morning of the 30th. At Zi-Ka-Wei the lowest barometer was 29.47 at 2.10 p. m., the wind veering suddenly from SSE. to W., reaching a maximum velocity of 29 miles at noon of the 31st. The central area was almost circular in form and inclosed by the isobars of 29.37, 29.53, 29.69, and 29.84 on the evening of the 30th, and by the isobars of 29.45, 29.61, 29.69 on the evening of the 31st. The United States man-of-war Monocacy, in lat. 34° 4′ N., long. 122° 45′ E., furnishes the following report: "The wind suddenly increased in force from the southeast, the barometer reading 29.45, and subsequently fell to 29.24, and the wind ranged from 6 to 9 in force, from SW." The center of disturbance passed near the southern point of Corea, and then turned to the east, passing over Japan near the 35th parallel, having advanced from Hankow, China, to Yedo, Japan, where it was central on June 1st, in seventy hours.

Ocean ice.—March 19th, 1882, in 46° 30′ N., 47° 30′ W., steamship Limosa passed through heavy field ice, had starboard bow stove; 31st, schooner Promise, 45 miles SW. of Cape Pine, was struck by large ice-floe and sunk; April 3d, 4th, and 5th, steamship Averill passed several large icebergs between 45° 55′ N., 45° 50′ W., and 43° 49′ N., 52° 56′ W.; 10th, steamship Donau in 46° 05′ N., 41° 36′ W., passed an iceberg; 12th, steamship Alaska in 43° 13′ N., 46° 40′ W., passed field ice; on the same date, in 42° 29′ N., 55° 37′ W., steamship Donau passed three large icebergs; 20th, steamship Alhambra, during the passage from Saint John's, Newfoundland, to Halifax, Nova Scotia, passed hundreds of icebergs, some being of enormous size; 18th, steamship Australia in 43° 21′ N., 48° 07′ W., passed several large icebergs and some loose ice; 16th, steamship Braunschweig in 43° 07′ N., 46° 24′ W., passed two large icebergs; 11th, steamship Cornwall in 46° 19′ N., 45° 00′ W., encountered ice, which continued for twenty-four hours; 13th, steamship Italy, between 43° 02′ N., 46° 50′ W., and 42° 44′ N., 49° 00′ W., passed several icebergs; 15th, steamship Lydian Monarch in 43° 25′ N., 46° 52′ W., passed an iceberg 70 or 80 feet high; 19th and 20th, steamship Nevada, between 45° N., 46° W., and 43° N., 51° W., passed several large icebergs and great quantities of field ice; 5th, steamship Denmark in 43° 23′ N., 46° 36′ W., passed an iceberg; 9th, steamship Donau in 46° 05′ N., 44° 36′ W., passed an iceberg; 11th, in 43° N., 48° 40′ W., passed three large icebergs; 8th, steamship Gloucester in 40° 51′ N., 52° 25′ W., passed an iceberg, from 120 to 150 feet high; 13th, Salier in 44° 42′ N., 45° 46′ W., passed a large number of icebergs and large quantities of field ice; 14th, in 43° 47′ N., 52° 20′ W., passed a large iceberg; 13th, steamship Surrey in 42° 30′ N., 49° 05′ W., passed several icebergs. Steamship Hermod reports that on the 8th, in 45° 20′ N., 48° 00′ W., the vessel was surrounded by ice. During a strong NE. gale and heavy swell the ice began to move, crushing heavily against the side of the vessel. It finally stove in the bows, filling the fore compartment with water. Heavy icebergs were seen all around us. Some were apparently a thousand feet long, and five to six hundred feet high. On the 11th, in lat. latitude 44° 00′ N., 49° 20′ W., found open water to the south, while to the NE. and NW. we had close ice. These fields of ice seem to end in 44° 00′ N., as south of that no field ice could be discovered, even from the top-gallant yards in clear weather, and a few icebergs only were seen; 28th, steamship Arizona, in 42° 37′ N., 49° 26′ W., passed a small iceberg, and same day, in 42° 37′ N., 50° 30′ W., passed a large iceberg; 18th, steamship Brantford City, in 42° 57′ N., 45° 52′ W., passed a small iceberg; 27th, steamship Britannic, in 42° 42′ N., 51° 55′ W., passed a small iceberg; 23d, steamship Devonia, in 44° 06′ N., 48° 41′ W., passed a large iceberg; same day, in 43° 41′ N., 49° 20′ W., passed another large one; 25th, steamship Glamorgan, in 46° 20′ N., 42° 30′ W., passed an iceberg fully 500 feet high; 25th, steamship Kronprinz Friedrich Wilhelm, in 43° 51′ N., 47° 59′ W., passed two large icebergs; 24th, steamship Persian Monarch, in 43° N., 48° W., passed an iceberg; steamship State of Nebraska reports, from lat. 44° 38′ N., long. 44° 48′ W., to lat. 42° 26′ N., long. 50° 15′ W., passed several icebergs and a quantity of small ice; 24th, steamship Thingvalla, in 43° 30′ N., 47° 45′ W., saw a great many icebergs. Steamship Valetta arrived at Saint John's, Newfoundland, from Boston, April 27, and reports having met ice 120 miles SE. of Louisburg, Nova Scotia, and numerous icebergs scattered along the course to Cape Race; 14th, bark Norge met ice in 46° 30′ N., 47° 10′ W., and got clear of it in 43° N., 48° W., passed a large number of icebergs. April 10, bark Seriah, in 47° 30′ N., 47° 00′ W., encountered heavy ice-fields and was surrounded for five days. Brig Jersey, at Saint John's, May 4, reports, got clear of ice in lat. 43° N.

The following interesting notes respecting the opening of navigation in European ice-bound harbors are given: Soderham, April 4, navigation open to Ljume. Elsinore, April 7, navigation at Ekenaes is declared open. Travemunde, March 17, the navigation of the Azof up to Taganrog was opened March 16. Stettin, March 17, the summer marks were laid out off the Kaiserfahrt yesterday. St. Petersburg, April 6, large quantities of ice are coming down the river; 11, the river and fairway are nearly free of ice. Abo, April 5, navigation is now open for steamers. Narva, March 30, the river is free of ice. Pernau, April 8, navigation opened. Bjorneborg, April 15, harbor nearly free of ice, navigation opened; the ports of Fredrickshams, Kotka, Borga, and Nystad are open. Pillau, the navigation at Carlstad reopened April 7. The average date of the opening of the Neva at St. Petersburg, as given by Woeikof, from data for nearly one hundred and twenty years, is about April 22. It was opened this year ten days earlier than the mean date of opening. The comparison extended to other ports where the opening of navigation is noticed would probably show that the past winter has been generally mild in north-western Europe and the present spring moderate.

The Sandusky Register of April 21, 1882, gives the following: "A large iceberg, which formed at Niagara Falls, has floated out into Lake Ontario and is to be seen about one mile and a half northeast of the harbor. It has been there several days and is attracting much attention, as it is said to be the first iceberg seen in that vicinity for the past twenty-eight years."

TEMPERATURE OF THE AIR.

The distribution of the mean temperature over the United States for the month of April, 1882, is exhibited on Chart II by the dotted isothermal lines. The table of mean comparative temperatures in the lower left-hand corner of the chart shows the average temperature for the month in the several districts, as determined from observations taken at the Signal Service stations during the month of April for previous years; the second column shows the mean temperature for the current month; the third column shows the departures of the mean temperature of the current month from the mean of several years.

The temperature has ranged from one to three degrees above the mean along the Atlantic coast from New York southward to Florida, and from two to three degrees above in the Missouri and Mississippi Valleys. In New England it has been slightly above the mean, except at the station on the summit of Mount Washington, where it averaged 4.1 degrees below. On the Pacific coast and at the Rocky Mountain stations the temperature ranges from two to four degrees below the mean, the greatest deviation being in the Middle Plateau region, where it was 4.7 degrees below the mean. At the station on the summit of Pike's Peak the mean temperature was .4 of a degree above the mean for the month of April.

Deviations from mean temperature.—Under this heading departures exhibited by reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of Chart II. The following items of importance in connection with this subject are reported by voluntary observers: *Connecticut:* Southington, mean temperature 43°.3 or about 2° below the average of the past twelve years. *Illinois:* Riley, mean temperature 43°.7 or 0°.4 below the average of the past twenty-one years. *Kansas:* Wellington, mean temperature 55°.6 or 1°.9 below the average of the past three years. The maximum temperature, 88°, occurred on the 25th, and is the lowest maximum temperature for the three years; the minimum, 32°, occurring on the 16th, is the highest for the same period. Lawrence, mean temperature 58°.83 or 3°.02 above the average April temperature of the fourteen preceding years. During that period the highest April mean, 58°.60, occurred in 1878; the lowest, 48°.85 and 48°.77, occurred in 1873 and 1874, respectively; the highest maximum, 93°, occurred in 1880, and the lowest minimum, 13°, occurred in 1881. *Maine:* Gardiner, mean temperature, 36°.96 or 4°.38 below the average of the past forty-six years. During that period there were only two Aprils whose mean temperature are lower than that of the current year, viz, 35°.88 in 1854 and 34°.97 in 1874. The maximum temperature for April, 1882, 57°, has been exceeded in every year during the above-mentioned period, with the exception of 1874, when the temperature did not rise above 52°. The minimum temperature for April, 1882, 7°, is the lowest April minimum recorded during the last forty-six years, with the exception of April, 1842, when the temperature fell to 5°. *Maryland:* Fallston, mean temperature 47°.7 or 2°.27 below the average of the last eleven years. During that period the highest April means, 55°.76 and 55°.47, occurred in 1871 and 1878, respectively; the lowest, 43°.91, occurred in 1874. *Michigan:* Thornville, mean temperature 44°.1, which is slightly below the April average. *Missouri:* Saint Louis, Missouri Weather Service reports mean temperature 58°.7, or nearly 3° above the average of the last forty-five years. *New Hampshire:* Contoocookville, mean temperature 41°.3 or 2°.5 below the average of the past eleven years. *New York:* North Volney, mean temperature 39°.24, or 2°.13 below the average of the past fourteen years. During that period the highest monthly mean, 50°.92, occurred in 1878; the lowest, 33°.59, occurred in 1874; the highest maximum temperature, 80°, occurred in 1881; lowest minimum, 14°, occurred in 1874. Palermo, mean temperature, 33°.6, is the lowest April mean for the past twenty-one years, and is 8°.1 below the average for the same period. *Virginia:* Wytheville, mean temperature, 54°.4, which is about 2°.4 above the average of eighteen years. During that period the highest April mean, 56°, occurred in 1866; the lowest, 47°, occurred in 1881; the highest maximum, 83°, occurred in 1868 and 1878; lowest minimum, 17°, occurred in 1881. *West Virginia:* Helvetia, mean temperature 49°.9, or 1°.46 above the average of past six years.

Table of comparative maximum temperatures for the month of April.

State or Territory.	Maximum for April, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station.	Temp. °	Station.	Temp. °	Year.	Place.	Temp. °	Year.	Length of record. Years.
Alabama	Mobile	89	Mobile	90	1881	Mount Vernon Arsenal	95		34
Do			Montgomery	90	1880				
Arizona	Phœnix	105	Yuma	105	1876	Fort Lowell	109	1879	11
Do						Fort McDonald	106	1879	14
Arkansas	Little Rock	85	Little Rock	94	1880	Fort Smith	96		21
Do						Mount Ida	95	1880	7
California	Visalia	91	Campo	94	1876	Fort Yuma	106		30
Do			Los Angeles	94	1881	Fort Miller	101		13
Colorado	West Las Animas	83	Denver	83	1874	Fort Lyon	98		20
Connecticut	New Haven	72	New Haven	73	'77, '78	New Haven	85		86
Do			New London	73	1877	Middletown	85		11
Dakota	Fort Bennett and Yankton.	86	Fort Meade	89	1881	Fort Sully	98		16
Do			Yankton	89	1874	Fort Randall	95		22
Delaware	Delaware Breakwater		Delaware Breakwater	89	1880	Fort Delaware	85		45
District of Columbia	Washington	84	Washington	87	'73, '81	Washington	91		49
Florida	Key West	88	Jacksonville	91	'74, '80	Okahumpka	99	1880	4
Do			Key West	91	1881	Fort King	94		10
Georgia	Augusta and Savannah	87	Augusta	89	1873, '78, '81	Augusta Arsenal	94		50
Do			Savannah	89	1873	Savannah	94		37
Idaho	Fort Lapwai	80	Lewiston	86	1880	Fort Boisé	90	1875	15
Do						Fort Lapwai	85		18
Illinois	Springfield	83	Cairo	84	1873	Rock Island Arsenal	89		11
Do						Chicago	84		33
Indiana	Indianapolis	80	Indianapolis	91	1874	Vevay	97		13
Indian Territory	Fort Gibson	85	Fort Sill	96	1880	Fort Sill	97		19
Do						Fort Gibson	95		48
Iowa	Des Moines	83	Des Moines	84	'79, '80	Mount Vernon	90		13
Do						Iowa City	90		15
Do						Glenwood	92	1880	2
Kansas	Dodge City	87	Dodge City	92	1880	Fort Leavenworth	102		51
Do						Fort Larned	96		18
Kentucky	Louisville	85	Louisville	87	'73, '80	Newport Barracks	89		30
Louisiana	Shreveport	93	Shreveport	93	1880	Fort Jesup	98		23
Do						Baton Rouge	96		58
Maine	Portland	62	Portland	78	1881	Fort Preble	90		59
Do						Gardiner	86		41

Maryland	Baltimore	82	Baltimore	84	1881	Fort Washington	93		38
Do						Fort McHenry	89		51
Massachusetts	Springfield	71	Boston	80	1881	Williamstown	87		61
Michigan	Detroit and Grand Haven	71	Marquette	81	1877	Fort Gratiot	94		22
Do						Detroit	90		41
Minnesota	Saint Paul	82	Saint Paul	82	1879	Fort Ridgley	90		11
Do						Fort Snelling	88		61
Mississippi	Vicksburgh	86	Vicksburgh	90.	1881	Fayette	89	1880	6
Do						Columbus	86		10
Missouri	Springfield	89	Saint Louis	87	1881	Jefferson Barracks	94		36
Do						Corning	94	1880	6
Montana	Fort Keogh	84	Fort Keogh	90	1881	Fort Shaw	93		12
Nebraska	Omaha	84	North Platte	90	1880	Fort McPherson	96		8
Do						Omaha	96		3
Nevada	Winnemucca	78	Pioche	80	1879	Fort McDermit	90	1881	15
New Hampshire	Mount Washington	36	Mount Washington	49	1877	Concord	88		8
Do						Dartmouth College	86		18
New Jersey	Barnegat and Little Egg Harbor.	74	Sandy Hook	74.5	1881	Vineland	88	1881	7
Do						Burnt Mills	88	1877	8
New Mexico	La Mesilla	95	La Mesilla	100	1879	Fort Craig	104		25
New York	Rochester	73	New York City	81	1877	Fort Niagara	94		58
Do						Ithaca	98		29
North Carolina	Charlotte	83	Wilmington	92	1873	Fort Johnson	88		57
Do						Weldon	90	'78, '80	7
Ohio	Cincinnati	82	Cincinnati	85	1873	Cincinnati	93		36
Do						Marietta	90		53
Oregon	Rosenburgh	80	Portland	83	1875	Fort Dalles	90		15
Do						Fort Haskins	90		8
Pennsylvania	Pittsburgh	83	Pittsburgh	88	1878	Philadelphia	88		120
Do						Carlisle Barracks	88		85
Rhode Island	Narragansett Pier	66	Newport	69	1877	Providence	82		85
South Carolina	Charleston	86	Charleston	87	1880	Fort Moultrie	89		38
Do						Charleston	88		105
Tennessee	Memphis	88	Chattanooga	88	1880	Ashwood	89	1880	3
Do						Glenwood Cottage	89		11
Texas	Rio Grande City	107	Rio Grande City	109	1878	Fort Ringgold	114	1878	82
Do						Fort McIntosh	108		27
Utah	Salt Lake City	73	Salt Lake City	83	1874	Kanab	88	1875	5
Do						Fort Crittenden	85		3
Vermont	Burlington	59	Burlington	75	1881	Lunenburgh	78		16
Do						Woodstock	78	1881	7
Virginia	Lynchburgh	85	Lynchburgh	91.5	1873	Accotink	96	1881	6
Do						Fortress Monroe	91		55
Washington Territory	Olympia	79	Dayton	91	1880	Fort Walla Walla	96		14
West Virginia	Morgantown	77	Morgantown	89	1878	Wellsburgh	88	1879	1
Do						Helvetia	86	1878	5
Wisconsin	Madison	78	La Crosse	83	1879	Fort Crawford	91		26
Wyoming	Cheyenne and Fort Washakie.	74	Cheyenne	80	1874	Fort Laramie	89		27

Ranges of temperature at Signal Service stations.—Monthly ranges of temperature during the month of April varied from 21° to 69° at stations east of the Rocky Mountains, and from 27° to 79° westward to the Pacific. The smallest ranges are: Punta Rassa and Key West, 21°; Port Eads, La., 23°; Cedar Keys, 25°; San Diego, Cal., 27°; Jacksonville, Fla., 29°; Santa Fé, Galveston, New Orleans, New Shoreham, R. I., and Macon, N. C., 30°; Pensacola, Fla., 32°; Hatteras, N. C., 34°; Portsmouth, N. C., 36°; Cape May, N. J., and Smithville, N. C., 37°; Indianola, Montgomery, Newport, R. I., and Savannah, 38°; Helena, Mont.; Vicksburgh, Wilmington, N. C., and Atlanta, 39°. The largest are: Campo, Cal., 79°; La Mesilla, N. Mex., and Stockton, Tex., 70°; Rapid City, Dak., 69°; Florence and Phœnix, Ariz., Fort Elliott, Tex., and Fort Meade, Dak., 68°; Concho and Fort McKavett, Tex., 67°; San Carlos and Tucson, Ariz., Silver City, N. Mex., West Las Animas, Colo., and El Paso, Tex., 65°. The greatest daily ranges varied in the different districts as follows: New England, from 15° at New Shoreham on the 9th to 37° at Mount Washington on 1st; Middle Atlantic States, 21° at Cape May on 5th and 25° at Philadelphia to 34° at Williamsport on 17th and 35° at Lynchburgh on 18th; South Atlantic States, 19° at Savannah on 1st and 26th, and 21° at Hatteras on 17th, to 29° at Charlotte on 18th and 30° at Augusta on 21st; Florida Peninsula, 14° at Key West on 27th, to 22° at Cedar Keys on 3d; Eastern Gulf States, 19° at New Orleans on 20th, to 28° at Montgomery on 21st, and 29° at Mobile on 29th; Western Gulf States, 16° at Galveston on 12th, 18° at Port Eads on 25th and 19° at Indianola on 23d, to 36° at Fredericksburgh, Tex., on 19th and 23d, and 39° at San Antonio on 23d; Rio Grande Valley, 27° at Brownsville on 23d, to 47° at Eagle Pass on 23d; Ohio Valley and Tennessee, 29° at Indianapolis on 1st and 18th, and 29° at Cincinnati on 18th, to 34° at Pittsburgh on 3d and 35° at Chattanooga on 21st; Lower Lake region, 29° at Oswego on 1st, 31° at Buffalo on 3d, and 31° at Erie on 4th to 37° at Cleveland and Toledo on 4th; Upper Lake region, 29° at Alpena on 2d, and 31° at Duluth on 3d, to 39° at Marquette on 4th; Extreme Northwest, 33° at Moorhead on 3d to 37° at Bismarck on 2d, and 38° at Saint Vincent on 5th; Upper Mississippi Valley, 28° at Springfield on 1st, Keokuk on 5th and Cairo on 10th, to 46° at Saint Paul on 1st; Missouri Valley, 29° at Springfield, Mo., on 21st, to 47° at Yankton on 2d and 49° at Fort Bennett, Dak., on 1st; Northern Slope, 25° at Helena on 19th, to 47° at Fort Keogh on 2d and 54° at Fort Benton on 4th; Middle Slope, 21° at Pike's Peak on 9th and 37° at Denver on 23d to 50° at West Las Animas, Colo., and 51° at Fort Elliott, Tex., on 25th; Southern Slope, 37° at Fort Griffin, Tex., on 10th, 39° at Henrietta and Jacksborough, Tex., on 20th, to 50° at Concho, Tex., on 20th, Coleman City, Tex., on 23d, and 51° at El Paso, Tex., on 9th; Southern Plateau, 33° at Santa Fé on 23d, to 53° at La Mesilla, on 26th; Middle Plateau, 30° at Salt Lake City on 20th, to 38° at Winnemucca, on 14th; Northern Plateau, 32° at Spokane Falls, Wash., on 3d and 13th, and 33° at Boisé City on 2d to 41° at Fort Missoula on 1st; North Pacific Coast region, 29° at Portland on 13th, to 40° at Olympia on 30th; Middle Pacific Coast region, 21° at San Francisco on 28th, to 32° at Red Bluff on 29th and 33° at Sacramento on 27th; South Pacific Coast region, 24° at San Diego on 22d to 50° at Campo on 29th.

Frosts.—In the various districts they were reported on the following dates: *New England:* 1st to 6th, 8th to 19th, 22d to 30th. *Middle Atlantic* States: 1st, 3d, 4th, 9th to 18th, 23d to 28th. *Tennessee:* 12th, 13th, 15th to 17th, 30th. *Ohio Valley:* 10th to 26th, 28th to 30th. *Lower Lake region:* 1st, 3d, 5th, 6th, 8th to 13th, 16th to 19th, 21st to 26th, 29th, 30th. *Upper Lake region:* 1st to 17th, 20th to 26th, 28th to 30th. *Extreme Northwest:* 1st, 2d, 4th to 7th, 9th to 15th, 19th, 20th, 22d, 28th, 29th. *Upper Mississippi Valley:* 1st, 10th to 17th, 20th, 21st, 23d, 24th, 27th, 29th, 30th. *Missouri Valley:* 6th, 8th, 10th to 12th, 14th to 17th, 20th, 27th to 30th. *Northern Slope:* 2d to 26th, 28th to 30th. *Southern Slope:* 15th. *Middle Slope:* 4th to 17th, 19th, 21st to 23d, 28th to 30th. *Southern Plateau:* 1st, 2d, 4th, 5th, 7th to 9th, 11th to 19th, 21st, 22d, 30th. *Middle Plateau:* 4th, 6th to 8th, 10th to 18th, 20th to 26th. *Northern Plateau:* 3d, 4th, 7th, 8th, 11th to 13th, 16th to 18th, 20th to 26th, 28th, 29th. *North Pacific Coast region.:* 6th, 7th, 9th to 13th, 16th, 20th, 22d, 23d, 25th, 27th, 28th. *Middle Pacific Coast region:* 23d, 25th.

Frosts were also reported from the following stations not included in the districts named above: Highlands, N. C., on 28th; Murphy, N. C., 11th, 12th; Weldon, N. C., 13th, 17th, 24th; Little Rock, Ark., 15th, 17th; Mount Ida, Ark., 15th, 16th, 30th; San Gorgonia, Cal., 6th, 7th, 8th, 9th, 17th, 18th, 21st, 22d, 24th, 25th. Injury to vegetation by frosts has been reported as follows: Lynchburgh, Va., 13th, light frost; great apprehension in regard to the fruit crop. Norfolk, Va., 25th, farmers report damage to fruit and vegetables by frost. Morgantown, W. Va., 13th, fruit and crops injured. Indianapolis, 30th, vegetation, which at beginning of month was forward, was retarded by cold weather of latter part of month. Injury by frost is variously estimated, and is not now considered as great as was first thought. Wheat so far advanced as to shoot was killed. The loss to cherry trees is about 60 per cent.; to apple trees about 30; to peach trees, not being in full bloom, the injury was slight. Garden vegetables are backward. Logansport, Ind., 10th, ice; it is feared that the fruit crop has suffered injury. Sandusky, 11th, the cold weather of last night has caused much fear respecting the fruit crop. Toledo, 12th, light frost; it is feared that fruit which is far advanced has been injured. Sandusky, 14th, it is now considered that the damage from cold weather of past few days has been overestimated, and that the injury is only slight. Milwaukee, 12th, fears are entertained that crops have been injured by late frosts. Port Huron, Mich., 12th, it is generally reported throughout the State that the crops have been seriously injured by the late cold weather. Dubuque, 11th, early vegetables and fruit considerably damaged by frosts of past two days. Coleman City, Tex., heavy frost, killing vegetation. Santa Fé, 14th, very cold; heavy frost, injuring early fruit. La Mesilla, N. Mex., 15th, temperature 24°.5; tender vegetation generally killed or injured; apricots, peaches, and apples almost entirely destroyed; leaves of tropical trees killed; 29th, temperature fell to 29°.8, causing slight injury to tender vegetation. Vevay, Ind., 1st, vegetation unusually forward. 11th, severe frost; all kinds of shrubbery and early flowering plants destroyed; apples, pears, plums, peaches, and cherries badly injured; wheat is also damaged. 12th, temperature 24°; vegetation, which has withstood the previous cold weather, entirely blighted. Wabash, Ind., 30th, much of the early fruit is killed and wheat injured by cold weather. Charleston, Ill., 30th, fruit nearly all killed by cold weather. Saint Meinrad, Ind., 11th, much injury done by frost. Fort Wayne, Ind., 10th, injuring blossoms. Independence, Kans., 15th, frost injuring vegetation in lowlands. Clay Centre, Kans., 30th, killing potatoes, peaches, grapes, and all tender plants. Creswell, Kans., 30th, very heavy frost, killing potatoes and injuring fruit. Federalsburgh, Md., 23d, 24th, severe frosts, seriously injuring peach crop. Pierce City, Md., 15th, killing potato vines. Bethel, Ohio, 11th, ground frozen; fruit injured; 15th, fruit and wheat killed by cold weather. College Hill, Ohio, 11th, ground frozen; much injury done to fruit. Portsmouth, Ohio, 11th to 16th, heavy frosts; nearly all of early fruit killed. New Athens, Ohio, 10th to 15th, nearly all of peach crop killed by cold weather; other fruits damaged. Wytheville, Va., 10th, 11th, vegetation seriously injured. Variety Mills, Va., 12th, unusually heavy frost, destroying vegetables. Wilmington, Del., 11th, temperature below freezing, causing great anxiety respecting peach crop. Middletown, Del., 11th, although the temperature fell to 29° no serious damage has resulted. Smyrna, Del., 11th, about 20 per cent. of the peach buds are open; ice formed to the thickness of three-quarters of an inch; no serious damage is feared. Felton, Del., 11th, no serious damage has been done to peach crop by cold weather. Bridgeville and Salisbury, Del., report that the peach-crop prospects have not been injured. Georgetown, Del., 11th, it is feared that serious injury to peach crop will result from cold weather. Fredericksburgh, Va., 11th, the sudden change in temperature has endangered the peach crop in northern Virginia. Wheeling, W. Va., 11th, dispatches from various points in this State, Ohio, and Pennsylvania show that the recent cold weather has damaged early apples, peaches, and small fruits; wheat has also been injured. Columbus, Ohio, 11th, the secretary of the State board of agriculture thinks that the fruit crop has been badly damaged, if not entirely destroyed. Farmers report the wheat crop to have suffered serious injury. Kalamazoo and South Haven, Mich., 11th, dispatches report prospects in the fruit belt as flattering, aside from the damage done small fruits from the recent cold weather. Memphis, 21st, reports from Haywood, Tipton, and Lauderdale Counties, Tennessee and Mississippi, and Crittenden County, Arkansas, state that the frosts of the 14th, 15th, and 16th killed all cotton in those counties, necessitating replanting, which will put back farming operations about two weeks.

Table of maximum and minimum temperature for March, 1882.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Mobile	89		Opelika	92	
Do	Montgomery		48	Uniontown		33
Arizona	Phœnix	105		Texas Hill	105	
Do	Prescott		21	Maricopa	107	
Arkansas	Little Rock	85	43	Madison	94	15
California	Visalia	91		Indio and Mammoth Tank.	104	
Do	Campo		10			
Colorado	West Las Animas	83	18	Fort Lyon	86	
Do	Pike's Peak	36	—5	Fort Garland		3

Table of maximum and minimum temperature for March, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Connecticut	New Haven	72	21	Southington	69	22
Dakota	Fort Bennett and Yankton.	86		Forts Hall and Sully	88	
Do	Fort Meade		8	Fort Pembina		— 6
Delaware	Delaware Breakwater.					
District of Columbia	Washington	84	27			
Florida	Key West	88		Live Oak	90	50
Do	Pensacola		52	Waldo	90	
Georgia	Augusta and Savannah.	87		Way Cross	91	
Do	Atlanta		43	Calhoun		38
Idaho	Fort Lapwai	80				
Do	Cœur d'Alene		20			
Illinois	Springfield	83		Anna and Charleston.	86	
Do	Chicago		25	Riley		18
Indiana	Indianapolis	80	24	Vevay	86	
Do				Spiceland		23
Indian Territory	Fort Gibson	85	34			
Iowa	Des Moines	83		Cedar Rapids	91	
Do	Dubuque		25	Clinton and Cresco		20
Kansas	Dodge City	87	26	Clay Center	94	
Kentucky	Louisville	85	31	Bowling Green	84	31
Louisiana	Shreveport	93	47	Alexandria	94	
Do				Amiti City		42
Maine	Portland	62		Dexter	62	2
Do	Eastport		9			
Maryland	Baltimore	82	29	Emmittsburg	86	24
Do				Fallston, Owing's Mills, Sandy Springs, and Woodstock.		24
Massachusetts	Springfield	71		Somerset	77	
Do	Boston		19	Heath		14
Michigan	Detroit and Grand Haven.	71		Niles	79	
Do	Alpena		12	Fort Brady		11
Minnesota	Saint Paul	82				
Do	Saint Vincent		—8			
Mississippi	Vicksburgh	86	47	Hernando	92	37
Do				Bateville, Grenada, and Lake.		37
Missouri	Springfield	89		Protem	90	
Do	Saint Louis		29	Curryville		21
Montano	Fort Keogh	84				
Do	Fort Shaw and Deer Lodge.		14	Fort Ellis and Blackfeet Agency.		10
Nebraska	Omaha	84		Fremont	90	
Do	North Platte		25			
Nevada	Winnemucca	78	18	Humboldt	89	
Do	Pioche		18	Boca		2
New Hampshire	Mt. Washington	36	—13	Contoocookville	64	
Do				New Market		11
New Jersey	Barnegat and Little Egg Harbor.	74		Atco	81	
				Somerville		21
Do	Atlantic City		24			
New Mexico	La Mesilla	95		Fort Stanton		5
Do	Santa Fé		18			
New York	Rochester	73	19	Fort Hamilton	75	
Do	Buffalo		19	Plattsburgh Barracks.		11
North Carolina	Charlotte	83	36	Salisbury	86	20
Do				Lumberton	86	
Ohio	Cincinnati	82		Portsmouth	90	
Do	Cleveland and Toledo.		22	New Athens and Ruggles.		20
Oregon	Roseburgh	80		Fort Klamath		7
Do	Umatilla		30			
Pennsylvania	Pittsburgh	83		Dyberry		14
Do	Erie		21			
Rhode Island	Narragansett Pier	66	23			
South Carolina	Charleston	86	46	Saint Matthews	90	26
Tennessee	Memphis	88		Austin		30
Do	Knoxville		36			
Texas	Rio Grande City	107				
Do	Grierson Springs		20			

Table of maximum and minimum temperature for March, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Section.	Max.	Min.	Section.	Max.	Min.
		°	°		°	°
Utah	Salt Lake City	73	26	Promontory	85	26
Do				Fort Douglas		26
Vermont	Burlington	59	15	Stafford	64	
Do				Lunenburgh		—2
Virginia	Lynchburgh	85	30	Accotink	86	
Do	Chincoteague		30	Variety Mills		23
Washington Territory	Olympia	79	30	Fort Canby	80	
Do	Pomeroy		27			
West Virginia	Morgantown	77	23	Helvetia	80	20
Wisconsin	Madison	78		Beloit	79	
Do	La Crosse		21	Ashland		10
Wyoming	Cheyenne	74	15	Fort Fred Steele	75	6
Do	Fort Washakie	74				

PRECIPITATION.

The distribution of rainfall over the United States and Canada, as determined from observations taken at over six hundred stations, is exhibited on Chart No. III. The table on the left-hand corner of this chart shows the average monthly rainfall, determined from the records of Signal Service stations in the several districts, and the excess or deficiency as compared with the average for many years.

There has been a deficiency of rainfall in New England, except on the summit of Mount Washington where the rainfall amounted to 11.2 inches, or 7.72 inches more than the average.

In the Middle and South Atlantic States, the Ohio Valley, and the Lower Lake region the deficiency amounted to less than one inch. In Tennessee and the Western Gulf States the deficiency ranged from 1.73 to 2.05 inches. On the North Pacific coast an excess of 2.09 inches is reported, while in the Middle and South Pacific Coast regions the rainfall was about one-half inch below the average.

At the station on the summit of Pike's Peak, 4.79 inches of rain are reported; the average for the month of April being 4.13 inches.

Deviations from average precipitation.—Under this heading, departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rainfalls (as published in the lower left-hand corner of Chart III). The following items of importance in connection with this subject are reported by voluntary observers: *Connecticut:* Southington, monthly rainfall 0.85 inch, which is much below the average of the past twelve years. During that period, the largest monthly precipitation for April, 5.41 inches, occurred in 1870; the smallest, 1.15 inches (with the exception of April, 1882), occurred in 1881. *Illinois:* Riley, monthly rainfall 3.29 inches, or 0.60 inch above the average of the past twenty-one years. Only the monthly rainfalls of April 1861, '68, and '72 exceeded that of the current year. *Kansas:* Wellington, monthly rainfall 3.10 inches or 1.04 inches above the average of the past three years. Lawrence, monthly rainfall 3.20 inches or 0.17 inch above the April average for the past fourteen years. During that period the largest monthly rainfall for April, 5.48 inches, occurred in 1878; the smallest, 1.08 and 1.27 inches, occurred in 1870 and '81 respectively. The total amount of precipitation for the four months ending April 30, 1882, is 7.18 inches, which is 0.62 inch more than the average for the same period in the fourteen preceding years. *Maine:* Gardiner, monthly precipitation 2.65 inches or 0.71 inch below the average of the past forty-six years. *Maryland:* Fallston, monthly rainfall 2.82 inches, or 0.45 inch below the average for the past eleven years. During that period, the largest April rainfall, 8.11 inches, occurred in 1874; the smallest, 1.76 inches, occurred in 1876. *Nebraska,* Sutton, monthly rainfall 10.95 inches, which has been exceeded but once in thirty years in this section, viz, at Plattsmouth in 1873, when the April precipitation was 15.90 inches. *New Hampshire:* Contoocookville, monthly precipitation, 1.00 inch, is less than one-third of the April average for the past eleven years. *New York:* North Volney, monthly rainfall 1.80 inches, or 0.42 inch below the average of past nine years. During that period the largest monthly precipitation, 3.65 inches, fell in 1874; the least, 0.65 inch, fell in 1879. Palermo, monthly rainfall 1.67 inches, or 0.70 inch, below the average of the past twenty-two years. During that period the largest monthly rainfall, 6.20 inches, fell in 1863; the least, 0.20 inch, fell in 1879. *Virginia:* Wytheville, monthly rainfall, 2.81 inches, or about 0.89 inch below the April average of eighteen years. During that period the largest April rainfall, 6.50 inches, fell in 1862; the least, 0.80 inch, fell in 1876. *West Virginia:* Helvetia, monthly rainfall, 4.26 inches, or 0.71 inch, above the average of the past six years. *Missouri:* Saint Louis, Missouri Weather Service reports, rainfall, 4.30 inches, or about the average of the past forty-five years.

Special heavy rains.—4th, Key West, Fla., 3.23 inches. Little Rock, Ark., 1.50 in thirty minutes; Prescott, Ark., 7.20. 7th, Protem, Mo., 1.64 in three hours; Amité City, La., 3.32. 7th and 8th, Corinth, Tenn., 4.50. 8th, Brownsville, Tenn., 6.04; Milan, Tenn., 5.00; Paris, Tenn., 3.14. 11th, Alexandria, La., 4.00. 12th, Griffin, Ga., 5.01; Dallas, Tex., 3.31; Monticello, Ark., 3.02; Prescott, Ark., 7.35. 18th, Vicksburgh, 2.43 in six hours; Natchitoches, La., 2.55. 18th and 19th, Mobile, 7.30, of which 6.70 fell in eight hours. 19th, Amité City, La., 2.80; Meridian, Miss., 2.50. 19th and 20th, Saint Augustine, Fla., 3.81 in ten hours; Waldo, Fla., 6.86. 21st, Booneville, Mo., 2.95. 22d, Chattanooga, 2.99; Dalton, Ga., 2.75; Tuscaloosa, Ala., 2.70; Arkansas City, Ark., 4.03; Monticello, Ark., 3.00; Aberdeen, Miss, 6.50; Columbus, Miss., 2.93; Macon, Miss., 2.65; Meridian, Miss., 3.20. 23d, Savannah, Ga., 1.19 in forty-five minutes; West Point, Ga., 2.69; Eastman, Tenn., 3.05; Columbia, Ga., 2.85. 27th, Fort Barrancas, Fla., 3.05 in three hours and forty minutes. 28th, Helena, Ark., 2.63; Oxford, Kans., 3.25; Prescott, Ark., 3.75. At Walnut Ridge, Ark., 6.79 inches fell on the 6th, 7th, and 8th.

Largest monthly rainfalls, including melted snow.—Prescott, Ark., 22.18 inches; Alexandria, La., 12.13; Amité City, La., 11.71; Aberdeen, Miss., 11.24; Mount Washington, 11.20; Sutton, Nebr., 10.95; Macon, Miss., 10.25; Waldo, Fla., 10.22; Mobile, Ala., 9.92; Brownsville, Tenn., 9.41; Tuscaloosa, Ala., 9.41; Meridian, Miss., 9.20; Walnut Ridge, Ark., 9.03; Corinth, Tenn., 9.02; Cheneyville, La., 8.89; Columbus, Miss., 8.52; Okolona, Miss., 8.41; State Line, Ala., 8.31; Natchitoches, La., 8.20; Green Springs, Ala., 8.18; Lake, Miss., 8.16; Demopolis, Ala., 8.16; Jackson, Miss., 8.14; Griffin, Ga., 7.84; Clinton, Iowa, 7.40; Calhoun, Ga., 7.38; Saint Augustine, Fla., 7.27; Monticello., Ark., 7.29; Stockham, Nebr., 7.20; Cedar Bend, Nebr., 7.19; Fort Barrancas, Fla., 7.08; Grenada, Miss., 7.08; Monroe, La., 7.08; Arkansas City, Ark., 7.08; Milford, Nebr., 6.88; Brook Haven, Miss., 6.90; Inavale, Nebr., 6.80; Fort Canby, Wash., 6.80; Chicago, 6.72; Protem, Mo., 6.61; West Point, Ga., 6.54; Fayette, Miss., 6.50; Pawnee City, Nebr., 6.50; Edwards, Miss., 6.33; Troy, Ala., 6.18; Crete, Nebr., 6.17; New Corydon, Ind., 6.01.

Smallest monthly rainfall, including melted snow.—Mammoth Tank, Mojave and Indio, Cal.; Texas Hill, Casa Grande, Benson, Wilcox, Yuma, Phœnix, San Carlos, and Pantano, Ariz.; El Paso, Tex.; Lordsburgh, N. Mex., and Terrace, Utah, none; Florence, Ariz., trace; La Mesilla, N. Mex., and Waco, Tex., 0.01; Camp Thomas, Ariz., 0.02; Fort Verde and San Simon, Ariz., 0.03; Kilton, Utah, and Tucson, Ariz., 0.05; Fort Grant, Ariz., 0.07; Silver City, N. Mex., 0.08; Concho, Tex., 0.09; Stockton, Tex., 0.12; Russellville, Ark., 0.14; Fort McDermott, Nev., 0.14; Concho, Tex., 0.17; Weimar, Tex., 0.20; Coleman City, Tex., and Talladega, Ala., 0.24; Antioch, Cal., Palisade and Browns, Nev., 0.25; Solidad, Cal., and Sante Fe, N. Mex., 0.26; Prescott, Ariz., 0.28; Carlin, Nev., 0.30; Promontory, Utah, 0.32; Uvalde, Tex., 0.33; Chualer, Cal., 0.34; Colusa, Cal., 0.35; Gainsville, Ga., and Reno, Nev., 0.38; Golconda, Nev., and Fort Wingate, N. Mex., 0.40; Texarkana, Ark., 0.42; Corsicana, Tex., 0.44; Cheyenne, Wyo., 0.46; Annaheim, Cal., 0.48; Brentwood, Cal., 0.49; Ticoma, Nev., Ravenna, Cal., and Pembina, Dak., 0.50.

Rainy days.—The number varied in New England from 10 to 21; Middle Atlantic States, 10 to 17; South Atlantic States, 8 to 19; Florida Peninsula, 8 to 13; East Gulf States, 11 to 12; West Gulf States, 6 to 14; Rio Grande Valley, 1 to 5; Ohio Valley and Tennessee, 10 to 16; Lower Lake region, 10 to 16; Upper Lake region, 8 to 18; Extreme Northwest, 8 to 13; Upper Mississippi Valley, 9 to 14; Missouri Valley, 10 to 16; Northern Slope, 8 to 15; Middle Slope, 6 to 15; Southern Slope, 0 to 8; Southern Plateau, 0 to 7; Middle Plateau, 10 to 14; Northern Plateau, 7 to 16; North Pacific Coast region, 18 to 21; Middle Pacific Coast region, 8 to 9; South Pacific Coast region, 0 to 8.

Cloudy days.—The number varied in New England from 5 to 14; Middle Atlantic States, 8 to 14; South Atlantic States, 6 to 12; Florida Peninsula, 4 to 6; East Gulf States, 6 to 11; West Gulf States, 5 to 15; Rio Grande Valley, 6 to 13; Ohio Valley and Tennessee, 7 to 12; Lower Lake region, 9 to 14; Upper Lake region, 5 to 12; Extreme Northwest, 5 to 12; Upper Mississippi Valley, 6 to 13; Missouri Valley, 9 to 16; Northern Slope, 6 to 13; Middle Slope, 2 to 8; Southern Slope, 0 to 7; Southern Plateau, 0 to 4; Middle Plateau, 4 to 12; Northern Plateau, 6 to 10; North Pacific Coast region, 14 to 16; Middle Pacific Coast region, 3 to 8; South Pacific Coast region, 1 to 6.

Snow.—The dates on which snow fell in the various districts are as follows: *New England*, 1st to 4th, 6th to 15th, 18th to 25th, 27th to 29th; Middle Atlantic States, 9th to 12th, 21st to 24th. Ohio Valley, 10th, 11th, 15th, 19th, 22d, 26th. Lower Lake region, 1st, 10th to 12th, 14th to 16th, 21st. Upper Lake region, 2d, 9th to 14th, 19th to 21st, 23d, 26th to 30th. Upper Mississippi Valley, 1st, 3d, 8th to 12th, 18th, 19th. Missouri Valley, 11th to 13th, 22d. Extreme Northwest, 5th, 6th, 9th, 13th, 22d. Northern Slope, 4th to 29th. Middle Slope, 3d, 4th, 7th, 8th, 10th to 14th, 16th, 17th, 21st, 27th to 30th. Southern Plateau, 5th, 7th, 10th, 12th to 14th, 17th, 20th to 22d. Middle Plateau, 3d to 6th, 9th to 11th, 15th to 17th, 20th, 22d to 23d. Northern Plateau, 10th, 16th, 19th, 20th, 22d to 24th, 26th, 27th. North Pacific Coast region, 6th, 20th, 23d. Lynchburgh, Va., 23d. The Blue Ridge Mountains, 20 miles distant, are partly covered with snow. Burlington, Vt., 29th. The summits of the Adirondacks (notably Mount Marcy) and of Green Mountains are covered with snow. In a sheltered place, 20 feet from signal office, snow remains to a depth of four feet.

Largest monthly snow fall.—Mount Washington, 66 inches; Cisco, Cal., 56; Summit, Cal., 32.5; Emigrant Gap, Cal., 26; Truckee, Nev., 18.5; Pike's Peak, Colo., 18; Blackfeet Agency, Mont., 17.6; Wells, Nev., 13; Otego, Nev., 12; Eastport, Me., and Boca, Nev., 10; Stratford, Vt., and Orono, Me., 9; Lunenburgh, Vt., and Hermosa, Cal., 8.5; Blooming Grove, Pa., 8; Alta, Cal., Elko, Nev., Port Jorvis, N. Y., and Beowawa, Nev., 6.

Depth of snow on ground at end of month.—*Colorado:* Pike's Peak, 18 inches. *Maine:* Eastport, 10 inches. *New Hampshire:* Mount Washington, 66 inches.

Hail.—Eastport, 2d. Manasquan, N. J., 2d. Lynchburgh, Va., 27th. Delaware Breakwater, Del., 23d. Philadelphia, 19th. Washington, D. C., 22d. Atlanta, 3d. Augusta, 9th, 22d. Mobile, 11th. Palestine, Tex., 11th, 8.04 p. m., heavy rain and hail-storm continuing until 8.18 p. m.; stones measured three-eighths of an inch in diameter. Considerable damage was done to fruit and growing crops. The storm is considered by residents to have been one of the severest ever experienced at this place. The damage to buildings, crops, &c., is estimated at about $175,000. Denison, Tex., 22d. Fort Gibson, Ind. T., 22d. Shreveport, 21st. Palestine, Tex., 28th. Little Rock, Ark., 11th. Indianola, Tex., 12th, severe hail-storm reported from Texana, Jackson County, destroying potatoes, melons, and other vegetables. In one place a field of corn nearly waist-high was completely destroyed for a mile square. On 14th, hail was reported to have fallen twenty miles north of station, and on the 16th hail fell at this station. Port Eads, La., 13th. Fort Concho, Tex., 7th, 8.55 p. m., hail measuring half inch in diameter. Nashville, 12th. Cincinnati, 10th, 26th. On the latter date between 4.48 and 4.53 p. m., hail fell rapidly; stones measured half inch in diameter; in some instances breaking window-glass. Memphis, 11th. Cleveland, 19th. Rochester, 2d, 28th. Chicago, 6th. Madison, Wis., 1st. Cairo, 22d. Saint Louis, 22d. Springfield, Ill., 6th. Omaha, 7th. Leavenworth, 11th, 18th, 21st. Huron, Dak., 8th. Springfield, Mo., 22d. Fort Bennett, Dak., 25th. Deer Lodge, Mont., 15th, 19th, 20th. Rapid City, Dak., 4th, 7th. North Platte, 7th, severe storm, accompanied by hail, which at first was small, but soon large egg-shaped and spherical stones fell, their average diameter being about one and one-fourth inches. Dodge City, Kans., 5th. Grierson Springs, Tex., 7th, 4.30 p. m., severe hail-storm, accompanied by thunder and lightning; stones weighing from one to two ounces. Henrietta, Tex., 21st, severe hail-storm reported from section about thirty miles east of station. Silver City, N. Mex., 13th. Helena, Mont., 19th. Fort Missoula, Mont., 20th. Umatilla, Oreg., 19th. Spokane Falls, Wash., 26th. Colfax, Wash., 15th. Boisé City, Idaho, 22d. Fort Lapwai, Idaho, 19th, 25th. Dayton, Wash., 23d, 25th. Red Bluff, Cal., 10th. Olympia, Wash., 20th, 25th. Fort Hale, Dak., 7th, 8th. Fort McDermitt, Nev., 6th, 9th, 10th. Fort Niagara, N. Y., 28th. Fort Concho, Tex., 7th. Camp near Presidio, Tex., 1st. Fort Douglas, Utah, 23d. Fort Canby, Wash., 20th, 23d to 26th. Olivet, Dak., 29th. Alexandria, Dak., 7th, 21st. Charleston, Ill., 26th. Spiceland, Ind., 26th. Vevay, Ind., 10th. Rising Sun and La Fayette, Ind., 10th. Cresco, Iowa, 3d. 9th, 21st. Nora Springs and Cedar Rapids, Iowa, 25th. Dana, Iowa, 8th. Holton, Kans., 3d. Independence, Kans., 11th, 21st. Yates Centre, Kans., 8th, 18th, 21st. Clay Centre, Kans., 11th, Creswell, Kans., 17th. Cornish and Gardiner, Me., 7th. Fallston, Md., 19th. Owing's Mills, Md., 20th. Federalsburg, Md., 23d. Woodstock, Md., 10th. Westborough, Mass., 7th. Litchfield, Mich., 26th, 27th. Fayette, Miss., 10th, 11th, on latter date hail-stones were very large, injuring gardens and cotton crop in some localities. Northfield, Minn., 3d, 18th, 26th. Protem, Mo., 8th, 11th, 22d. Blackfeet agency, Mont., 24th. De Sota, Nebr., 21st. Genoa, Nebr., 7th. Acto and Moorestown, N. J., 19th. Freehold, N. J., 26th. Ithaca, N. Y., 6th. Waterburgh, N. Y., 7th, 27th. White Plains, N. Y., 22d. Portsmouth and College Hill, Ohio, 26th. New Athens, Ohio, 22d. Fallsington, Pa., 2d, 19th. West Chester and Meadville, Pa., 19th. Dallas, Tex., 11th, 5.10 p. m., severest hail-storm, with largest hail ever known at this place. Stateburgh, S. C., 22d. Clarkesville, Tex., 28th. Woodstock, Vt., 2d. Wytheville, Va., 4th, 26th. Manitowoc, Wis., 1st. Beloit, Wis., 25th, Embarras, Wis., 29th.

Sleet.—Sleet was reported by the following stations: Bangor, Me., 13th; Mount Washington, N. H., 4th, 7th, 8th; Boston, 27th, 28th; Washington, 10th, 13th, 23d; Erie, Pa., 9th; Knoxville, Tenn., 12th; Nashville, Tenn., 13th; Vevay, Ind., 10th, 25th; Spiceland, Ind., 10th; New Athens, Ohio, 22d; Chicago, 23d; Milwaukee, 10th; Dubuque, Iowa, 10th, 22d, 23d; Saint Paul, 22d; Fort Snelling, Minn., 8th; Leavenworth, Kans., 11th, 12th; Holton, Kans., 11th; Omaha, Nebr., 7th; North Platte, Nebr., 11th; Fort Bennett, Dak., 7th; Huron, Dak., 22d; Tobacco Garden, Dak., 7th, 8th, 9th; Cheyenne, Wyo., 4th; Pike's Peak, 27th, 28th, 30th; Fort Garland, Colo., 21st; Fort Stanton, N. Mex., 16th; Florence, Ariz., 29th; Henrietta, Tex., 13th; Fort Washakie, Wyo., 17th, 20th; Salt Lake City, 10th; Fort Benton, Mont., 10th, 16th; Dayton, Wash., 20th.

Cotton region report.—Arrangements have been made with the co-operation of the railroad and telegraph lines, in the Southern States, to the end that daily reports of the rainfall, maximum and minimum temperatures may be collected, and the results published throughout the commercial centers of the cotton region, from April 1 to October 31, inclusive.

The accompanying chart exhibits the arrangements of stations and districts, and the railroad system of the cotton regions. This system of reports was successfully begun on the first of April, and continued during the month. The following table gives the average rainfall, mean of the maximum, and the mean of the minimum temperatures in each district:

Meteorological record for the cotton districts for the month of April, 1882.

Districts.	Average rainfall.	Mean of maximum.	Mean of minimum.
	Inches.		
New Orleans	5.73	81.9	59.9
Savannah	3.73	81.1	60.2
Charleston	2.66	77.5	54.5
Atlanta	4.49	76.3	54.9
Wilmington	3.88	74.2	50.0
Memphis	5.29	74.9	54.0
Galveston	1.58	82.1	57.9
Vicksburgh	7.03	78.6	56.8
Montgomery	4.92	78.5	57.2
Augusta	3.05	78.2	54.7
Little Rock	4.74	75.9	51.9
Mobile	3.80	79.1	57.3

This being the first Review in which reference is made to this important feature of Signal Service reports, the following list of stations is given, showing the extent of each district in the cotton region, from which the full signification of the means and averages of the above table may be determined. It will be seen that the districts embrace the territory adjacent to the more important cities where Signal Service stations are located:

Cotton region districts.

Districts and centers.	Stations.	
	Where.	On what railroad.
Savannah	Cedar Keys, Fla. Fernandina, Fla Waldo, Fla	Atlantic, Gulf and West India Transit. These reports are concentrated at Cedar Keys and telegraphed to Savannah, Ga.
	Jesup, Ga Way Cross, Ga Live Oak, Fla Quitman, Ga Thomasville, Ga Bainbridge, Ga Albany, Ga	Savannah, Florida and Western.
	Smithville, Ga Fort Gaines, Ga	South Western.
	Millen, Ga	Central of Georgia.
	Allapaha, Ga	Brunswick and Albany.
	Eastman, Ga	Macon and Brunswick.

Cotton region districts—Continued.

Districts and centers.	Stations.	
	Where.	On what railroad.
Charleston	Jacksonborough, S. C.	Charleston and Savannah.
	Yemassee, S. C.	
	Hardeeville, S. C.	
	Georges, S. C.	South Carolina.
	Branchville, S. C.	
	Saint Mathew's, S. C.	North-Eastern.
	Kingstree, S. C.	
Wilmington	Weldon, N. C.	Wilmington and Weldon.
	Goldsborough, N. C.	
	Lumberton, N. C.	Carolina Central.
	Wadesborough, N. C.	
	Charlotte, N. C.	
	Salisbury, N. C.	Richmond and Danville Line.
	Cheraw, S. C.	Cheraw and Darlington.
	Florence, S. C.	Wilmington, Columbia and Augusta.
Augusta	Chester, S. C.	Charlotte, Columbia and Augusta.
	Columbia, S. C.	
	Allendale, S. C.	Port Royal and Augusta.
	Macon, Ga	Georgia.
	Columbus, Ga.	South-Western.
	Athens, Ga.	Georgia.
	Covington, Ga	
	Madison, Ga	
	Union Point, Ga	
Atlanta	Newman, Ga.	Atlanta and West Point.
	West Point, Ga	
	Gainesville, Ga	Richmond and Danville Line.
	Tocoa, Ga.	
	Spartanburgh, S. C.	
	Cartersville, Ga	Western and Atlantic.
	Calhoun, Ga	
	Dalton, Ga	
	Griffin, Ga	Central of Georgia.
Montgomery	Opelika, Ala	Western of Alabama.
	Troy, Ala	Mobile and Girard.
	Greenville, Ala.	Mobile and Montgomery.
	Pine Apple, Ala.	Pensacola and Selma.
	Uniontown, Ala.	Alabama Central.
	Demopolis, Ala	
	Tuscaloosa, Ala.	Alabama Great Southern.
	Selma, Ala	Louisville and Nashville.
	Birmingham, Ala.	
	Calera, Ala.	
	Talladega, Ala.	Selma Division, East Tennessee, Virginia and Georgia.
Mobile	State Line, Ala.	Mobile and Ohio.
	Waynesborough, Miss.	
	Meridian, Miss.	
	Macon, Miss.	
	Columbus, Miss.	
	Aberdeen, Miss	
	Okolono, Miss	
New Orleans	Scranton, Miss	Louisville and Nashville.
	Pass Christian, Miss	
	Brookhaven, Miss.	Chicago, Saint Louis and New Orleans.
	Amité City, La.	
	Terre Bonne, La	Morgan's Louisiana and Texas.
	Morgan City, La.	
	Franklin, La.	
	New Iberia, La	
	Vermillionville, La	
	Whiteville, La	
	Cheneyville, La.	
	Alexandria, La.	Merchants' Union Telegraph Line, connecting with Western Union lines at Minden.
	Natchitoches, La.	
	Coushatta	
	Minden, La.	
Galveston	Orange, Tex.	Texas and New Orleans.
	Beaumont, Tex	
	Houston, Tex.	Houston and Texas Central.
	Hempstead, Tex.	
	Hearne, Tex	
	Corsicana, Tex.	
	Waco, Tex	
	Dallas, Tex.	
	Huntsville, Tex.	International and Great Northern.
	Palestine, Tex.	
	Longview, Tex	
	Tyler, Tex	
	Austin, Tex	

Cotton region districts—Continued.

Districts and centers.	Stations.	
	Where.	On what railroad.
Galveston	Belton, Tex	Gulf, Colorado and Santa Fé.
	Weimar, Tex	Galveston, Harrisburgh and San Antonio.
	Luling, Tex	
	San Antonio, Tex	
	Weatherford, Tex	Texas and Pacific.
Little Rock	Paris, Tex	Texas and Pacific.
	Texarkana, Ark	Saint Louis, Iron Mountain and Southern.
	Prescott, Ark	
	Malvern Junction, Ark	
	Kensett, Ark	
	Walnut Ridge, Ark	
	Brinkley, Ark	Memphis and Little Rock.
	Madison, Ark	
	De Vall's Bluff, Ark	
	Russellville, Ark	Little Rock and Fort Smith.
	Fort Smith, Ark	
	Arkansas City, Ark	Little Rock, Mississippi River and Texas.
	Monticello, Ark	
Vicksburgh	Edwards, Miss	Vicksburgh and Meridian.
	Jackson, Miss	
	Lake, Miss	
	Monroe, La	Vicksburgh, Shreveport and Pacific.
Memphis	Grand Junction, Tenn	Memphis and Charleston.
	Corinth, Tenn	
	Tuscumbia, Ala	
	Decatur, Ala	
	Scottsborough, Ala	
	Withe, Tenn	Louisville and Nashville.
	Brownsville, Tenn	
	Milan, Tenn	
	Paris, Tenn	
	Erin, Tenn	
	Clarksville, Tenn	
	Nashville, Tenn	Nashville, Chattanooga and Saint Louis.
	Hernando, Miss	Mississippi and Tennessee.
	Batesville, Miss	
	Grenada, Miss	

RELATIVE HUMIDITY.

The mean relative humidity for the month ranges as follows in the several districts: New England, from 57 to 76; Middle Atlantic States, 53 to 75; South Atlantic States, 66 to 81; Florida Peninsula, 71 to 74; East Gulf States, 67 to 78; West Gulf States, 63 to 83; Rio Grande Valley, 57 to 82; Ohio Valley and Tennessee, 57 to 66; Lower Lake region, 64 to 72; Upper Lake region, 67 to 77; Extreme Northwest, 74 to 80; Upper Mississippi Valley, 55 to 71; Missouri Valley, 62 to 70; Northern Slope, 61 to 66; Middle Slope, 44 to 60; Southern Slope, 33 to 66; Southern Plateau, 30 to 37; Middle Plateau, 43 to 53; Northern Plateau, 53 to 75; North Pacific Coast region, 70 to 76; Middle Pacific Coast region, 59 to 73; South Pacific Coast region, 36 to 74. High stations report the following percentages not corrected for altitude: Cheyenne, Wyo., 49.6; Pike's Peak, 83.0; Santa Fé, 36.6; Mount Washington, 86.6.

WINDS.

The prevailing winds during the month of April at Signal Service stations are shown on Chart No. II by arrows flying with the wind:

On the New England and Middle Atlantic Coasts the winds are northwest to southwest. In the South Atlantic States, from southeast to southwest, except at Hatteras, Kitty Hawk, and Norfolk, where they are northeasterly. In the Gulf States, Indian Territory, Tennessee, and Kansas, southerly winds prevail, while in the Ohio, Upper Missouri and Mississippi Valleys, the winds are generally from north to east. South to west winds prevail on the North Pacific coast, and west to northwest in northern California. In the Plateau Regions the winds are generally from south to west.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 22,005 miles; Pike's Peak, 16,938; Hatteras, N. C., 12,935; Portsmouth, N. C., 12,702; Kittyhawk, N. C., 11,854; New Shoreham, R.

I., 11,552; Indianola, Tex., 11,098; Sandusky, 11,093; Dodge City, Kans., 11.109; Fort Elliott, Tex., 10,712; Sandy Hook, N. J., 10,305; Champaign, Ill., 10,057; Bismarck, Dak., 10,035; Huron, Dak., 10,010; Cape Henry, Va., 9,757; Barnegat, N. J., 9,680; Milwaukee, Wis., 9,646; Grand Haven, Mich., 9,580; Galveston, Tex., 9,551; Cape May, N. J., 9,432; North Platte, Nebr., 9,412; West Las Animas, Colo., 9,344; Moorhead, Minn., 9,286; Macon, N. C., 9,204; Fort Keogh, 9,163; Rochester, 9,106; Port Eads, La., 9,040; Yankton, Dak., 9,032; Henrietta, Tex., 9,016; Eagle Rock, Idaho, 8,702, Punta Rassa, 8,632; Madison, Wis., 8,613; Concho, Tex., 8,363; Oswego, N. Y., 8,267; Boston, Mass., 8,239; Detroit, Mich., 8,072; Santa Fé, N. Mex., 8,068; Chincoteague; Va., 8,035; Port Huron, Mich., 8,003. The smallest are: Lynchburgh, Va., 2,676, Lewiston, Idaho, 2,692; Augusta, Ga., 2,739; Los Angeles, Cal., 2,786; Florence, Ariz.; 2,947.

High winds.—On the summit of Mount Washington the maximum velocity, 120 miles, NW., on 22d. Velocities of 100 miles, NW., occurred on the 2d, 13th, and 18th. Velocities of 50 miles, or over, occurred as follows: 92 miles, NW., 17th; 90, NW., 4th; 86, NW., 16th; 81, NW., 7th; 80, NW., 8th; 75, NW., 21st; 68, SW., 1st; 68, NW., 30th; 66, NW., 23d; 60, NW., 12th and 20th; 60, SE., 19th; 58, NW., 5th; 55, NW., 29th; 52, NW., 14th; 50, NW., 9th. On the summit of Pike's Peak, Colo., the maximum velocity, 64 miles, SW., occurred on the 25th; other high velocities occurred as follows: 60 miles, SW., on the 20th and 24th; 58, SW., 3d; 56, NW., 8th; 52, SW., 23d; 50 SW., 19th. Other stations reporting velocities of 50 miles per hour, or over, are as follows: Eagle Rock, Idaho, 55 miles, SW., 19th; Fort Keogh, 50 W., 26th; Dodge City, Kans., 52, S., 17th; Palestine, Tex., 50 W., 22d; Toledo, 50, E., 23d; Kitty Hawk, N. C., 51, W., 10th; Hatteras, N. C., 56, NE., 10th; Portsmouth, N. C., 66, NE., 10th, 52, SW., 23d.

Local storms.—Palestine, Tex., 22d, violent storm; wind reaching maximum velocity of 50 miles; much damage done in this city to fences, buildings, &c. Sandusky, Ohio, 23d, destructive gale, reaching its height at 2.15 a. m. The schooner Gallatin, while off Cleveland, sprung a leak and the high wind caused her to fill rapidly. She became unmanageable and went ashore on Chickanola Reef and sank. During the gale there were thirty vessels sheltered at Kelly's Island; all of them were more or less damaged. At Marblehead, seven docks were washed away. The damage by this storm to fishing interests was very great.

Topeka, Kans., 6th, during evening, a tornado started near Raymond, in Rice County, moved in a northerly direction and prostrated the telegraph poles, when it crossed the Santa Fé Railroad track. In this neighborhood several buildings were demolished, one person was killed and another fatally injured. Proceeding northward the storm struck the town of Chase, demolishing twenty out of thirty-six buildings, and threw railroad cars from the track; three persons were killed and one fatally injured. At the same time another small tornado passed through the eastern part of the county, but did little damage. In some places the wind sucked all of the water out of wells. As the storm-cloud approached Chase it was of funnel-shape, whistling and twisting with great velocity. Many of the inhabitants were more or less injured, but few escaping without hurt of some kind. The people are living in box-cars, and many families are in destitute condition.

At Strafford, Kans., a village of about eighty houses, about two hundred miles southwest of Topeka, all but two houses were blown down; one man was killed and several persons were more or less injured. Reports from Keosauqua say great damage was done throughout the lower Des Moines Valley. At Keosauqua one house was demolished and several others injured; trees and fences blown down in all directions. At Ashton, Mo., same date, a tornado did great damage; four houses were demolished and others suffered loss of chimneys and roofs.

Detroit, 6th, between Clyde and Highland, near the Flint and Pere Marquette Railway, about forty miles from Detroit, about 8 p. m., a violent tornado occurred; houses were destroyed and a number of lives were lost. In Alamo Township, Kalamazoo County, houses and barns were unroofed, two persons were killed, and another injured. The storm struck this section between 5 and 6 p. m., and moved eastward across the northern part of the country.

At Otsego, Allegan County, Michigan, the storm was very severe and was accompanied by hail and vivid lightning. From the westward of this place, the storm could be distinctly seen curveting in the sky. After leaving Allegan and Kalamazoo Counties, the storm passed across the northwest corner of Calhoun County, and across the southern part of Barry County, where in the latter it struck near Hickory Corners, in Johnstown township, about 5.30 p. m., and was accompanied by the heaviest hail ever known in that section, doing great damage to orchards and breaking windows. Its course was from west to east and every thing in its track was demolished. The width of track where the greatest damage was done is from forty to fifty rods. Inside this expanse it cleared everything, leaving a course as decidedly marked as the path of a reaper through a field of grain. Outside the immediate path the damage was slight on either side; and at a quarter of a mile distant no damage was done. A number of dwellings, barns, and other buildings were blown down or unroofed. Several persons were injured.

At Bedford Centre, Calhoun County, the tornado was seen in a northerly direction, in the form of a funnel-shaped cloud with the vortex downward, moving to the northeast, and seemed to lower itself to the earth, again ascend, and move onward in the upper regions. It passed through the township of Kalamo, Eaton County, within a mile of Charlotte, sweeping everything in its path, which was from four to twenty rods in width. The largest trees were twisted off from four to thirty feet from the ground and carried considerable distances. A number of dwelling were totally destroyed, together with numerous other buildings. Several lives were lost and many persons injured. Many persons, seeing its approach, took refuge in their cellars and thus escaped bodily injury. The damage at this place is estimated at $100,000. In this vicinity the tornado was accompanied by hail sufficiently large to break windows.

In Ingham County the tornado struck the southeastern corner in the northern part of White Oak township, accompanied by hail and thunder. Several houses were totally destroyed; one man was instantly killed by a piece of timber; a number of sheep were killed by falling timbers of the barn in which they were sheltered. A pond near the barn, in which the water was several feet deep, was emptied of all the water. In Livingston County no damage has been reported.

At 5 p. m., Mount Pleasant, Isabel County, was struck by a severe hail-storm; some of the stones were an inch and a half in diameter; one was picked up that measured six inches in circumference. In Midland County, several dwellings, barns, and other buildings were destroyed; one person killed and several injured. Its course was in an easterly direction, and its path not more than one-quarter of a mile wide. The tornado struck Bay County about 6 p. m., causing great destruction in the townships of Williams, Beaver, and Kawkawlin. In Angres township the damage was less serious. It passed through three miles of timber and scarcely left a tree standing.

Port Huron, Mich., 9th., 12 m., during gale a sail-boat was capsized and sunk. Cairo, Ill., 22d, about 4.40 p. m., a violent tornado struck this city. It first struck this vicinity near Charleston, Mo., about twelve miles south-southwest of Cairo, where fences were blown down and trees uprooted for a distance of about one and a half miles in length and three-fourths of a mile in width. Its first appearance was in the northern part of the city. Its path over the city was about one mile wide. In the northern part of the city, four empty freight cars were blown from the track; many houses were unroofed, chimneys and trees blown down. Two hundred feet of wooden sidewalk was lifted and carried a distance of 100 feet. In another place 30 feet of heavy oak sidewalk, 20 feet in width, was taken up and carried a distance of 60 feet, breaking down a telegraph-pole in its course. A large gas-holder, 60 feet in diameter, was struck and overturned; the heavy iron columns supporting the tank were torn off and broken. Persons and animals were taken up and carried considerable distances. The damage done in Cairo is estimated at $30,000.

In East Cairo, Kentucky, a transfer building, 300 feet long, was completely demolished. Beyond this place the tornado lifted from the earth and continued its north-northeasterly course, descending at a point about five miles distant, where it swept over a farm, blowing down and uprooting large trees, demolishing fences, &c. From this place it again ascended and did not strike the earth until it reached a point a little west of Carmi, Illinois, where it was very destructive. In this vicinity a double log-house was totally demolished; other houses and outbuildings were blown down or unroofed; orchards and many miles of fencing were destroyed. No damage was done in Carmi.

Springfield, Ill., 6th, severe storm of rain, hail, and thunder; several barns in vicinity were unroofed or blown down, together with trees, fences, signs, &c. No damage was done in the center of the city.

Smithville, Dak., 21st, very heavy rain and snow storm, accompanied by high wind. Fifteen miles of telegraph line between Smithville and Rapid City were prostrated.

Dodge City, Kans., 6th, reports from Lyon, a small town about one hundred miles east of this city, say that the town was nearly destroyed by a tornado on the 5th instant. Two persons are reported to have been killed.

Dana, Iowa, 8th, about 5 p. m., a tornado passed near station, accompanied by rain and hail, destroying buildings and doing other damage.

Savannah, Ga., 24th, a tornado of destructive force occurred near Macon, Ga., on night of 23d instant; several lives were lost and considerable property destroyed.

Evergreen, Ind., 19th, about 12.30 a. m. a destructive tornado visited this place; seventeen buildings were destroyed, many others injured. The damage in Evergreen is estimated at $35,000.

The observer at Des Moines sends the following report of the tornado which originated opposite Sheldahl, Iowa, on the evening of the 8th and moved in a northerly direction, passing about one mile north of Ames, Iowa: "The average width of path was about 300 feet, and its length about 12 miles. A number of buildings in its path were destroyed; the agricultural college was unroofed, trees were torn up by the roots, and fences and light buildings were blown away."

New Orleans, 18th: During the evening a severe tornado visited the southern part of this parish. In the city proper, except a few signs that were blown down and a few limbs blown from the trees, but little damage was done. At Carrollton, at 6.30 p. m., it could be seen coming in a northwesterly direction from a point about a mile distant on the other side of the river. In an instant it struck the river, raising from it a quivering column of water 60 feet high. It struck the ferry-wharf, lifting it from the river and landing it some distance on the bank in a demolished condition. Many dwellings were blown down or unroofed; several persons were injured by falling timbers. The damage to property is estimated at $25,000.

Morgan City, Louisiana: During the night of the 13th this section was visited by a most terrible storm, causing the water to rise and destroying an immense amount of property. The Ramos railroad-bridge was carried away, and at Drew's Mills about twenty dwellings were destroyed; only one house remained standing. Along Bayou Teche cabins and other small buildings were destroyed on every plantation. In Berwick a school-house was blown from its foundation and two men killed by the falling timber. Many persons narrowly escaped drowning. The destruction of live stock throughout a large section of country is very great. A sugar-house in Saint Charles Parish was blown down and a man killed. At Fausse Point 40 houses were swept away, and the loss of stock, crops, &c., is enormous.

On the 19th a terrible tornado struck Brownsville, Mo., completely destroying a large part of the town. Eleven persons were killed and one hundred and fifty injured. Over fifty houses in the heart of the town were demolished. The storm struck the town at 4 p. m.; large two-story brick buildings were lifted from their foundations and the ruins scattered in all directions; frame dwellings were overturned and crushed into splinters; large trees were uprooted and carried long distances; and animals were picked up, carried various distances, and dropped lifeless along the path of the storm. Just before the funnel-shaped cloud struck the town, a loud roaring noise was heard, which was followed by several loud electrical explosions. The funnel-shaped mass had a rapid rotary motion, drawing within its votex everything with which it came in contact. The storm-track was about 200 yards wide, with a zigzag course from southwest to northeast.

At Renick, Randolph County, about 6 p. m., 60 miles northeast of Brownsville, a tornado exhibited considerable violence, which was attended by a whirling motion.

At Montrose, Henry County, 4.10 p. m., a violent tornado did much damage.

In Reynolds County, Mo., on the 8th, at 6 p. m., a small tornado, about 100 yards wide, swept everything clean in its path. The same locality was visited by the memorable tornado of 1850.

Pennsville, Pa., on the 19th: a severe storm burst suddenly on this community about 4 p. m.; it was of short duration and very limited in its track. It moved from southwest to northeast, passing over the northern part of Fayette County. The destruction by this tornado has never before been equalled by any like occurrence. Buildings were demolished or unroofed; chimneys, fences, and trees blown down; and a number of persons were injured, some of whom have since died.

New Orleans, April 22d, a tornado swept across the Chicago, Saint Louis and New Orleans Railroad, between Summit and Bayou Chitto, Miss., prostrating telegraph poles on both sides of the track for a distance of one mile and uprooting trees, many of them falling across the railroad.

Monticello, a town 20 miles east of Brookhaven, at 12.15 p. m., was nearly destroyed—only three houses, on the outskirts, being left. Nothing before has ever been experienced like this at this place. Ten persons were killed instantly. Out of a population of 150, very few escaped without injury. A fine residence, four miles west of Monticello, was entirely destroyed.

Natchez, Miss., 19th, about 9 p. m., a storm of great severity burst upon the city, continuing for a few minutes, during which time it wrecked buildings, uprooted trees, prostrated fences, and tore signs from their fastenings, while the accompanying rain deluged cellars, doing an incalculable amount of damage. Great damage was done to fruit and spring vegetables by the hail. The course of the storm was from northwest to southeast.

Abilene, Kans., 7th, heavy rain and wind storm doing considerable damage in the eastern and southwestern parts of Dickinson County.

At Chapman, a church was demolished; roofs of several houses were blown off; barns and other buildings damaged.

At Woodbine, a church, three buildings, and a blacksmith shop were demolished.

On Holland Creek, 18 miles southwest from Abilene, considerable damage was done. This storm struck the county at the southwest corner and traveled in a northeasterly course.

On the same date, at Rosalia township, in Butler County, Kans., 10.30 p. m., three houses were overturned, one man killed, and several persons injured. The storm was from southwest to northeast.

Junction City, Kans.: About midnight a tornado passed over this neighborhood from the southwest which was very destructive.

At Fort Riley, Kans., most of the buildings were unroofed and a portion of the walls destroyed, involving a loss of from $25,000 to $30,000. At Wakefield, Clay County, eight houses were destroyed. In all parts of the county, barns, out-houses, and fences were destroyed.

Maysville, Ky., 28: A tornado has caused great destruction on Tuckehoe ridge; several large tobacco-houses were blown down and their contents scattered. At Lawrence, a brick church was unroofed and one end blown in; a school-house, two dwellings, and a number of barns and outbuildings were destroyed. The storm was the most violent ever known in this section.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for April, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 84.9 per cent. The percentages for the four elements are: Weather, 87.4; Direction of the Wind, 88.1; Temperature, 84.1; Barometer, 79.1 per cent. By geographical districts they are: For New England, 82.6; Middle Atlantic States, 85.0; South Atlantic States, 84.4; East Gulf States, 87.4; West Gulf States, 86.0; Lower Lake region, 86.2; Upper Lake region, 83.8; Tennessee and the Ohio Valley, 83.1; Upper Mississippi Valley, 83.9; Lower Missouri Valley, 84.1; Northern Pacific Coast region, 94.1; Middle Pacific Coast region, 78.0; Southern Pacific Coast region, 98.6.

There were 96 omissions to predict (38 being due to the absence of reports from the Pacific coast) out of 3,690, or 2.33 per cent. Of the 3,594 predictions that have been made, 98, or 2.73 per cent., are considered to have entirely failed; 102, or 2.84 per cent., were one-fourth verified; 397, or 11.04 per cent., were one-half verified; 673, or 18.73 per cent., were three-fourths verified; 2,324, or 64.66 per cent., were fully justified, so far as can be ascertained by the tri-daily reports.

Cautionary signals.—One hundred and ninety-five cautionary signals were displayed during the month of April, of which 168, or 86.1 per cent., were justified by winds of 25 miles per hour at or within 100 miles of the station. Thirteen off-shore signals were displayed, of which 9, or 69.2 per cent., were fully justified; 12, or 92 per cent., were justified as to velocity; and 10, or 76.9 per cent., were justified as to direction; of all kinds displayed, there were 208, of which 177, or 85.1 per cent., were justified. Thirteen cautionary signals were changed to off-shore signals. The above does not include signals ordered at 69 display stations, where the velocity is estimated only.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand of Chart number III are given the highest and lowest stages of water observed at Signal Service stations during the month of April. At stations in the Lower Mississippi it will be seen that the water has fallen from the first of the month, when it was above the danger line at Cairo and Vicksburgh, and only five inches below the danger line at Memphis. At the close of the month it had fallen at all stations south of Cairo; but remained two feet above the danger-line at Vicksburgh At stations in the Upper Mississippi the highest water occurred between the 20th and 30th. On the 25th, at Keokuk, it was 2 feet and 2 inches above the danger line, or 16 feet 8 inches on the gauge. The Lower Missouri reached its maximum about the 10th of the month, and was at its minimum height from the 3d to 5th. The Ohio was highest at Pittsburgh on the 28th, and highest at Louisville and Cincinnati from the 1st to the 3d of the month.

Ice in rivers and harbors.—Lake Champlain: : Burlington, Vt., 5th, steamer Williams left this port for Plattsburgh, N. Y., but was unable to enter harbor on account of ice. 6th, during morning lake frozen over inside Breakwater, and also a portion of Broad Lake. 7th, ice passed out of harbor during morning but remained in portions of lake. 29th, heavy ice on lake shore. *Penobscot River:* Bangor, Me., 8th, ice rapidly breaking. 9th, ice moving out of river. 10th, river open to navigation; first arrival. *Lake Superior:*

Marquette, 13th, ice cleared from around the docks. Duluth, Minn., 8th, large field of ice was blown into this end of lake during storm. 23d, barge N. K. Fairbanks arrived from Buffalo; first arrival from lower lakes. 28th, ice nearly all driven out of lake by northwest wind. Ashland, Wis., 27th, navigation opened. *Missouri River:* Fort Yates, Dak., 1st, ice broke up quietly and began running out at 8 a. m. 16th, first boat arrived. 19th, first boat departed. Bismarck, 3d, ice breaking in river below bridge, but is closed above. 5th, ice broke up and moved out at 8.45 a. m. Fort Stevenson, Dak., 12th, first arrival of season. Yankton, Dak., 2d, ferry-boat New Ella, from Sioux City, arrived; first of season. 9th, navigation fully opened; steamer Big Horn, for Bismarck, passed upward to-day. *Red River of the North:* Moorhead, Minn., 14th, river clear of ice. 19th, navigation opened; steamer J. L. Grandin departed for Forks and Pembina. *Erie Canal:* 8th, water began to flow in canal. 12th, canal navigation opened. *Mississippi River:* Saint Paul, 1st, 3d, and 4th, floating ice in river; 10th, steamer War Eagle, from Saint Louis, arrived; first boat of season. *Green Bay:* Escanaba, 4th, during storm, ice broke in bay; no damage resulted to shipping interests. 7th, during night ice moved out of the middle of bay; navigation practically opened. 8th, barge Nahant, from Ashtabula, Ohio, arrived; first of season. *Lake Winnipiseogee:* Lake Village, N. H., 25th, ice cleared in lake. *Cumberland River:* Nashville, 29th, river very low; navigation on the Upper Cumberland is nearly suspended.

Floods.—Mobile, Ala., 18th, 19th, owing to excessive rainfall many houses in city are flooded, compelling occupants to remove furniture to places of safety; some of the streets are impassable. In some instances stock has been in great danger of drowning. Memphis, 15th, the Memphis and Little Rock Railroad Company sent a train from this city through to Madison, Ark., being the first trip made over that road since January 30, owing to the submerged condition of the track.

Keokuk, Iowa, 22d, river rose above danger-line during morning and continued to rise all day. The Saint Louis, Keokuk and Northwestern Railroad Company were compelled to discontinue trains. 23d, river 15 inches above danger-line; lumber yards and saw-mills in lower part of town have abandoned work on account of high water. 26th, river nearly stationary. 27th, river falling slowly. Dubuque, 19th, considerable damage has resulted from the recent heavy rains; lowlands have been flooded, cellars filled, and gardens ruined. Land slides of trees, rocks, and earth have occurred on the lines of the Chicago, Milwaukee and Saint Paul and the Illinois Central Railroads, causing delay of trains. Saint Louis, 23d, the main sewer of the city drainage system gave way during the evening, being caused by the late heavy rains; fifteen blocks of houses were flooded almost instantly; many of the occupants had to be rescued in boats. The damage is estimated from $250,000 to $500,000. The rains throughout Kansas and Missouri were the heaviest ever known in places. At Effingham, Kans., streams overflowed their banks and bridges were washed away. At Clarksville, Mo., rain was very heavy, and the river rose to such an extent that it was feared the Sny levee would give way. Fargo, Dak., 11th, the Red River is still rising and an ice-dam threatens to form against the piers of the Northern Pacific bridge. All the cabins along the river on low ground are deserted, and the houses on Island park have the basements flooded. The water is now one foot above high water of last year. The damage is estimated at $100,000. Mud is knee-deep all over the city. The Union elevator is half under water and is in danger of falling. The Grand elevator is also half under water and basements are flooded. 21st, the Saint Paul, Minneapolis and Manitoba Railroad bridge has been badly damaged by having its approaches nearly washed away. Their bridge across the Cheyenne River is being held down by cars loaded with railroad iron, the water running to a depth of two feet over the top of the bridge. At Grandin station both the railroad and wagon-bridge were carried away. The water is running over the track the entire distance between Grandin and Harwood stations. At Hillsborough, a new and stoutly built bridge was lifted from its foundation. The bridge at Maysville has been carried away. The railroad-bridge across the Elm River on the Casselton branch has been swept away. Nearly all the houses built on the lowlands at Grand Forks have been carried away.

Saint Vincent, Minn., 23d, there are 3 feet of water on the track between Emmerson and this place. Until the water subsides traffic will remain suspended between here and Saint Paul. The water has fallen 8 feet during past twenty-four hours, enabling those who abandoned their homes on the flats to return to them.

New Ulm, Minn., 14th, the Minnesota River is gradually spreading over the bottom lands. Communication with Nicollet County is now only kept up with skiffs.

The water in the lower Mississippi River has continued to fall throughout the month. The subject of floods in this section has been considered in previous numbers of the Review. At the close of the month the stage of the water at New Orleans was 8 inches, and at Vicksburgh 2 feet above the danger line.

High tides.—Indianola, Tex., 4th, 5th, 30th. Toledo, 23d, water in river higher than ever known, a condition caused by severe northeasterly gale. At 7 a. m. the water was 6 feet above the ordinary level. Considerable damage was done along the banks of the river; lumber was washed away, a pile driver sunk, and many small boats were lost. The embankment of the Toledo and Ann Arbor Railroad was washed away for a considerable distance; both the embankment and a portion of the trestle were completely battered down. Damage is estimated at $3,000. Sandusky, 23d, water in bay suddenly rose 15 feet, flooding the entire length of Railroad street, and reaching a greater height than has been known for twenty-five years. Large quantities of lumber were washed away. The water fell as rapidly as it rose.

The following table shows the highest stages of water reached in the Ohio River, at Cincinnati, with dates of occurrences, since 1832:

Year.	Date.	Height.	
		Ft.	*In.*
1832......	February 18	62	11½
1847......	December 17	62	8½
1858......	June 16	43	10
1859......	February 22	55	5
1860......	April 16	49	2
1861......	April 19	49	5
1862......	January 24	57	4
1863......	March 12	42	9
1864......	December 23	45	1
1865......	March 7	56	3
1866......	September 26	42	6
1867......	March 14	55	3
1868......	March 30	48	3
1869......	April 2	48	9
1870......	January 19	55	3
1871......	May 13	40	6
1872......	April 13	41	9
1873......	December 18	44	5
1874......	January 11	47	11
1875......	August 6	55	4
1876......	January 29	51	9
1877......	January 20	53	9
1878......	December 15	41	4
1879......	December 27	42	9
1880......	February 17	53	2
1881......	February 16	50	7
1882......	February 20, 6 a. m	54	1
1882......	February 20, 11.30 a. m	54	11
1882......	February 20, 12.40 p. m	55	7
1882......	February 20, 2.50 p. m	55	10
1882......	February 20, 5.30 p. m	56	3
1882......	February 20, 7 p. m	56	6
1882......	February 21, 8 a. m	58	6

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the right hand of Chart II. Observations on temperature of water were not taken at the following-named stations, on the dates given, on account of ice in harbors: Escanaba, 1st to 8th, inclusive; Marquette, 1st to 6th; Duluth, 1st to 27th.

In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the month. It will be seen that the greatest range of water temperature occurred at the west Gulf stations, where it ranged from 18°.4 at Indianola to 19° at Galveston. At the stations on the eastern Gulf the smallest ranges in water temperature were reported.

The following table gives the highest and lowest temperature of water observed at the several stations, with the range of water temperature, mean temperature of the air at the station, and the depth of water at which the observations were taken:

Temperature of water for April, 1882.

	Temperature at bottom.		Range.	Average depth.		Mean temperature of air at station.
	Max.	Min.				
	°	°	°	*Ft.*	*In.*	°
Atlantic City	53.3	45.0	8.3	5	0	46.8
Alpena	44.0	31.0	13.0	12	0	36.7
Augusta	74.6	63.5	11.1	8	9	66.6
Baltimore	54.5	47.5	7.0	9	8	52.0
Boston	45.6	39.5	6.1	25	0	42.0
Buffalo	49.9	38.6	11.3	10	0	40.8
Burlington	38.3	34.0	4.3	19	5	38.7
Cedar Keys	79.0	71.0	8.0	8	7	73.4
Charleston	45.0	35.0	10.0	40	8	66.6
Chicago	49.9	42.1	7.8	7	9	45.8
Chincoteague	59.0	43.0	16.0	6	4	48.9
Cleveland	50.0	40.4	9.6	14	0	44.4
Detroit	46.0	37.0	9.0	24	2	45.9
Duluth	36.0	34.5	1.5	15	3	37.5
Eastport	37.3	33.3	4.0	16	2	35.0
Escanaba	44.0	33.0	11.0	15	0	36.6
Galveston	77.0	58.0	19.0	14	9	72.5
Grand Haven	49.0	30.5	18.5	19	0	43.6
Indianola	79.0	60.6	18.4	9	3	73.1
Jacksonville	76.0	71.0	5.0	18	0	70.9
Key West	85.0	73.5	11.5	17	2	78.5
Marquette	38.9	31.8	7.1	10	7	36.5
Milwaukee	47.1	39.6	7.5	8	0	42.8
Mobile	70.3	65.0	5.3	16	0	70.5
New Haven	51.2	39.7	11.5	14	9	43.5
New London	46.0	40.0	6.0	12	11	44.7
Newport	46.0	38.5	7.5	10	9	43.1
New York	49.3	41.3	8.0	22	2	46.1
New Shoreham	46.1	39.3	7.7	9	4	43.2
Norfolk	61.0	54.0	7.0	16	10	55.7
Pensacola	73.5	66.7	6.8	18	0	70.4
Portland, Me	42.0	34.0	8.0	19	2	43.3
Portland, Oreg	52.3	43.2	9.1	72	11	48.5
Port Eads	68.0	64.0	4.0	9	10	72.7
Provincetown	47.5	38.5	9.0	14	0	41.7
Punta Rassa	85.5	72.6	12.9	11	9	75.3
Sandusky	52.1	39.8	12.3	10	1	46.2
Sandy Hook	48.9	42.5	6.4	2	1	46.8
San Francisco	54.6	53.3	1.3	29	0	52.4
Savannah	71.4	64.9	6.5	13	4	68.0
Smithville	72.0	61.0	11.0	10	0	62.2
Toledo	55.0	42.0	13.0	11	9	46.5
Wilmington	69.5	61.5	8.0	13	0	63.2

ATMOSPHERIC ELECTRICITY.

Auroras.—Auroral displays were of unusual frequency during the month. The display which began on the evening of the 16th was the most extraordinary that has occurred for many years, and was visible at a great number of stations throughout the United States. It was observed as far south as Key West, at stations in the Gulf States, in southern Texas, New Mexico, and California, and by numerous steamships and vessels. On vessels in the north Atlantic, during the display, the magnetic needle deviated north and south of its true position; and long telegraphic circuits, extending north and south, east and west, in the United States, were worked without the aid of battery. The following extract from a communication, published in Nature, from Mr. A. G. Whipple, an English scientist, shows that its influence was also felt in England:

"It may interest some of your readers to know that a magnetic storm of unusual intensity raged from about midnight of Sunday, the 16th, to midnight of the 17th. We observe a tremendous spot which appeared on the sun's disc, first on the 13th, is now rapidly approaching the central meridian, and a group observed on Saturday a little in advance of it appears to have undergone considerable change in the interval.

G. M. WHIPPLE,
Kew Observatory, Richmond, Surrey.

April 18, 1822."

Eastport, Me., 16th, a faint diffuse auroral light appeared in the north at 8 p. m. It gradually rose toward the zenith, increasing in brilliancy. At 8.30 p. m. a striated arc extending from northwest to northeast, with a breadth of 15° and altitude of 45°. At 8.40 p. m. the arc dissolved into numerous beams, all parallel to each other and pointing toward the zenith. At 9 p. m. the whole northern sky from west to east was filled with beams, some of which were of blood red and others of light red color. It continued to extend southward and at 11 p. m. reached the zenith, forming a half crown. At 11.30 p. m., the whole sky was filled with beams, all pointing toward the zenith, forming a perfect corona, and some of the beams reaching within 10° of the southern horizon. At 11.40 p. m. the aurora became slightly obscured by cirrus clouds. At midnight it was still visible, though rapidly fading. Telegraphic communication was seriously interrupted by its influence.

Washington, D. C., 16th, an aurora was visible at 9.54 p. m., in the form of an arc, 2° in width and about 6° above the northern horizon; the base of the dark segment measuring about 35°. At 11 p. m., the arc was quite brilliant and of increased dimensions; the pale green light which had been formerly observed had then become quite strong; the summit of the arch had reached an altitude of 12°, the arch itself being fully 8° in width, while the base of the segment measured about 55°. At 11 p. m., a few faint streamers projected not more than 3° above and from the corona of the arch. At 11 p. m., the summit of the arch reached an altitude of 20° and extended from 100° to 250° azimuth; brilliant streamers, narrow and pointed at the ends, shot upward to the zenith from the whole length of the arch; the upward motion was very rapid, and resembled flashes of lightning. The streamers gradually diminished in length and brilliancy after midnight, and at 12.40 a. m. of 17th no motion was perceptible. At 12.45 a. m. the arch was faintly defined and without streamers. At 1 a. m. the arch was again well defined and of brighter color. At 1.30 the aurora revived, but did not equal its former brilliancy; the crown of the arch had an elevation of about 10°, without any change in its azimuth; broad streamers flashed upward at short intervals, some extending nearly to zenith. At 2 a. m. the streamers subsided, and at 2.12 a. m. the arch broke up into faint bands of light. At 2.25 only a faint light remained in the northern sky. At 3.40 a. m. a small, well-defined arch of about 5° altitude and 30° azimuth, without streamers, was visible. At 4 a. m. a few streamers without motion were observed, and continued until daylight. The color of the aurora throughout the entire display was a pale yellow, with the exception of a broad streamer at the western extremity, which from 11.30 to 11.40 p. m. was of bright crimson. At Key West, Fla., from 1 to 1.30 a. m. on the 17th, the aurora was observed, consisting of a diffuse light, resembling the morning twilight, extending to an altitude of 10°, and from 134° to 190° azimuth.

Chicago, 16th, Aurora observed at 9.40 p. m., consisting of a hazy segment of 15° altitude, surmounted by an arch of light about 5° broad, extending from about 40° east of north to 30° west of north. The arch slowly ascended and at 10.15 p. m. was of about 40° altitude. During the next ten minutes the arch widened toward both zenith and horizon, and disappeared, leaving only a faint glow. At 10.30 p. m., vertical columns began to shoot upward from near the north point toward the zenith, which were soon accompanied by similar displays from first the west, and afterward from the east, the aurora meanwhile having extended laterally to about 55° west of north and to about 70° east of north. The shafts gradually extended laterally and finally converged to a point about 15° south of the zenith, changing in color from pale yellow to blue, red, and crimson, shooting up and down from horizon to zenith, resembling a ray of sunlight reflected from a rapidly-rotated mirror. About 10.45 p. m. it reached its maximum brilliancy. The point of convergence near the zenith, a circular black nucleus, presented a decided contrast to the brilliancy of the converging beams, which varied from a deep red at their summits to a pale blue near the horizon. At this time the display covered two-thirds of the sky. At irregular intervals, a tremulous swinging movement from east to west, and vice versa, was observed. At 10.55 p. m. it began to fade, and at 11 p. m. only a faint glow remained, varied by occasional feeble beams shooting from the horizon toward the zenith. The wires of the various telegraph offices were unusually affected. At the Western Union office, the batteries were detached and the wires worked to both Omaha and New York, the current being very powerful. Wires running north and south were also much affected but not nearly so powerfully as those running east and west. The display continued until daylight of the 17th, and was characterized by recurring fits—consisting chiefly of vertical shafts shooting upward from the horizon with great rapidity and quickly disappearing, and a faint luminous glow resembling dawn.

At Indianola, Tex., the aurora was observed from 10 to 10.30 p. m. in the northern sky extending 10° east and 10° west of the magnetic meridian and to an altitude of 45°; no streamers or arch were visible, but the aurora consisted of a diffuse pale red light, resembling the light of a distant prairie fire.

At Olympia, Wash., from 12.30 to 12.50 a. m. the aurora was observed through broken clouds, resembling the glow of a distant fire.

At San Francisco, 16th, 8.15 p. m., an unusually brilliant aurora of deep crimson color spread over the northern sky, extending to an altitude of 35°, with a wavy motion, which soon afterwards settled to a dull steady glow and gradually died away at 9.30 p. m. At 11 p. m. it appeared again, consisting of several columns of white to orange color, extending to a height of 75°. The display attracted the attention of a large number of spectators, who imagined it to be the reflection from a large fire. At Visalia, Cal., the display began at 8.35 p. m. The northern sky from east to west was of a fiery color, with a motion from east to west; its greatest brilliancy occurred between 8.35 and 9 p. m.; altitude 50°; azimuth 135°; it remained visible until 4 a. m. of 17th.

The following interesting report furnished from the United States steamer Vandalia, in lat. 30° 10′ N., long. 78° 19′ W., by Captain R. W. Mead, United States Navy, commanding, is of special interest: A very remarkable aurora borealis was noticed, beginning at 10 p. m., Sunday, April 16th, and ending about 4.30 a. m., Monday, April 17th, 1882. It was preceded by an arc of greenish hue, the base of which was about 45° in length, with its center not more than 10° in height, directly under the Pole star. This lasted about half an hour, when wave-like shafts of light of different shades of pink, blue, yellow, and greenish white colors shot up, all converging toward a common point, about 20° directly above the north star. The base increased one point, ending at NNE. and the other at WNW. Evidently the compass was affected, for when the light at the northern point increased in intensity, the ship apparently came to windward of the course (attributed at the time to bad steering), but when the light at the western end increased in brilliancy, the ship, apparently, fell off to the leeward. The compass course was northeast by east; wind east by north.

The display next in importance to that of the 16th was observed during the evening of the 19th and early morning of 20th. At many stations it was scarcely less brilliant than that of the 16th. It was observed from stations in New England westward to Umatilla, Oreg., and southward to Nashville, Tenn., and at Phœnix, Ariz. Displays of less importance and of varying brilliancy also occurred on the following dates: 5th, 13th to 24th, 28th, 29th.

Thunder-storms.—They were reported in the various districts on the following dates: *New England*, 2d, 4th, 6th, 7th, 19th, 20th. *Middle Atlantic States*, 2d to 4th, 6th, 9th, 10th, 12th, 14th, 19th, 20th, 22d, 23d, 26th, 27th, 28th, 30th. *South Atlantic States*, 2d to 5th, 7th to 10th, 12th, 19th, 20th, 22d, 23d, 27th to 29th. *Florida Peninsula*, 8th, 10th, 15th, 20th. *East Gulf States*, 2d, 3d, 5th to 13th, 17th to 20th, 22d, 26th to 29th. *West Gulf States*, 2d, 5th to 12th, 18th, 19th, 21st, 22d, 26th to 29th. *Rio Grande Valley*, 7th, 8th, 26th, 28th, 29th. *Ohio Valley and Tennessee*, 2d to 4th, 6th to 9th, 18th, 19th, 21st to 23d, 26th to 28th. *Lower Lake region*, 1st, 2d, 4th, 6th, 7th, 19th, 27th, 28th. *Upper Lake region*, 1st to 4th, 6th to 9th, 18th, 19th, 22d, 26th, 27th. *Upper Mississippi Valley*, 1st to 9th, 18th, 21st, 22d, 25th, 26th. *Missouri Valley*, 1st to 8th, 11th, 17th to 19th, 21st, 22d, 25th, 26th, 28th. *Southern Slope*, 4th, 5th, 7th, 10th, 11th, 21st, 26th to 30th. *Southern Plateau*, 1st, 3d, 12th to 14th, 16th, 29th, 30th.

Thunder-storms were also reported from the following stations not included in the districts named above: Bismarck, Dak., on the 7th; Blackfeet agency, Mont., on 24th; Fort Custer, Mont., 6th; Terry's Landing, Mont., 24th; Fort Washakie, Wyo., 11th; Fort Collins, Colo., 17th; Pike's Peak, 4th; North Platte, Nebr., 4th, 8th, 17th, 25th; Dodge City, Kans., 7th; Spokane Falls, Wash., 26th; Eagle Rock, Idaho, 3d; Boisé City, Idaho, 22d; Fort McDermitt, Nev., 3d.

During thunder-storms the following instances of damage by lightning occurred: Burlington, Vt., 6th, at Winooska Falls, during morning, a church was struck by lightning; a cross on the building was thrown down and a quantity of slating was torn off. Chattanooga, 22d, a tree was struck by lightning; a person in vicinity was stunned and a cow killed. Friendship, N. Y., 2d, 6 a. m., lightning struck an oil-tank and two derricks. Buffalo, 2d, the railroad station at Buffalo Plains was struck by lightning, set on fire and destroyed. Another building was also consumed at the same time.

OPTICAL PHENOMENA.

Solar halos have been observed in the various districts on the following dates:

New England, 1st, 4th to 6th, 8th, 10th, 19th, 24th, 25th. *Middle Atlantic States*, 1st, 3d, 4th, 9th, 18th, 22d to 24th, 26th, 29th. *South Atlantic States*, 1st, 13th, 18th, 22d, 26th. *East Gulf States*, 17th, 20th, 24th, 25th, 30th. *West Gulf States*, 3d, 4th, 6th, 8th, 20th, 24th, 27th. *Tennessee*, 5th, 6th, 11th, 18th, 28th. *Ohio Valley*, 1st to 6th, 8th, 11th, 12th, 17th, 18th, 20th, 21st, 24th, 27th, 28th. *Lower Lake region*, 1st, 4th, 5th, 7th, 9th, 18th, 19th, 22d, 23d, 25th, 26th, 29th. *Upper Lake region*, 10th, 12th, 16th, 17th, 18th, 21st to 26th, 28th. *Upper Mississippi Valley*, 4th to 7th, 11th, 12th, 21st, 23d, 24th. *Missouri Valley*, 3d to 6th, 18th, 29th. *North Pacific Coast region*, 2d, 12th, 13th, 29th, 30th. *Middle Pacific Coast region*, 4th, 7th, 10th, 11th, 14th, 16th to 19th, 21st, 22d, 28th to 30th.

Solar halos were also reported from the following stations not included in the districts

named above: Key West, 9th, 10th, 16th, 19th; Santa Fé, N. Mex., 2d, 12th; Salt Lake City, 12th, 29th; Umatilla, Oreg., 13th; Dayton, Wash., 29th; Carson City, Nev., 11th; San Diego, Cal., 9th; Campo, Cal., 27th.

***Lunar halos* have been observed in the various districts on the following dates:**

***New England*, 4th, 26th, 29th. *Middle Atlantic States*, 2d, 4th, 8th, 14th, 16th, 23d, 25th, 28th, 29th. *South Atlantic States*, 1st, 3d, 5th, 19th, 27th, 28th, 30th. *East Gulf States*, 24th, 26th, 27th, 29th, 30th. *West Gulf States*, 3d, 4th, 23d to 25th, 27th, 29th; Tennessee, 5th, 21st, 26th; Ohio Valley, 3d to 6th, 13th, 23d, 25th, 28th. *Lower Lake region*, 1st, 3d, 10th, 26th. *Upper Lake region*, 1st, 3d to 6th, 8th, 16th, 20th, 22d to 26th, 29th. *Upper Mississippi Valley*, 1st, 3d to 6th, 22, 23d, 25th, 26th. *Southern Slope*, 1st to 3d, 23d, 24th, 26th, 30th. *Northern Slope*, 22d, 25th. *Southern Plateau*, 1st, 2d, 28th, 29th. *North Pacific Coast region*, 28th, 29th. *Middle Pacific Coast region*, 1st, 4th, 22d, 26th, 30th.**

Lunar halos were also reported from the following stations not included in the districts named above: Fort Brown, Tex., 3d; Fort Yates, Dak., 27th; Yankton, Dak., 20th; Protem, Mo., 3d, 4th; Fort Washakie, Wyo., 29th; Pike's Peak, Colo., 2d; Spokane, Wash., 1st; Winnemucca, Nev., 8th; Salt Lake City, Nev., 2d, 22d, 29th; Umatilla, Oreg., 23d Boisé City, Idaho, 29th; Visalia, Cal., 1st, 28th, 30th.

***Mirage.*—Rio Vista, Cal., 17th; Alexandria, Dak., 4th, 15th, 28th, 29th; Indianola, Tex., 23d, 29th.**

MISCELLANEOUS PHENOMENA.

***Sunsets.*—The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from 187 stations show 5,494 observations to have been made, of which 25 were reported doubtful; and of the remainder, 5,469, there were 4,539, or 83.0 per cent., followed by the expected weather.**

***Sun spots.*—The following record of observations has been forwarded by Mr. D. P. Todd, director of the Lawrence Observatory, Amherst, Mass.:**

Date—April, 1882.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 1 p. m......	1	2	0	0	0	0	6	‡30	
2, 1 p. m......	2	‡10	0	0	0	0	8	‡40	
4, 3 p. m......	0	15	2	10	0	0	5	‡40	
7, 4 p. m......	3	‡20	2	15	....	....	6	‡45	Spots probably disappeared by solar rotation.
9, 1 p. m......	1	5	0	5	1	5	7	‡45	
12, 1 p. m......	2	‡25	1	5	2	‡20	8	‡65	
13, 1 p. m......	0	5	1	3	0	5	5	‡55	
16, 12 m	1	‡30	0	0	1	2	6	‡85	
17, 6 p. m......	1	‡35	0	5	1	2	7	‡125	Many of the spots very small.
18, 5 p. m......	2	‡40	1	2	0	0	8	‡160	
20, 1 p. m......	0	0	1	‡10	0	0	7	‡125	
21, 2 p. m......	1	1	1	5	1	1	7	‡110	Many of the spots small.
24, 2 p. m......	0	0	....	....	0	0	3	‡20	Three large groups of spots probably disappeared by solar rotation.
25, 1 p. m......	0	0	0	6	0	0	3	14	
28, 4 p. m......	1	6	1	8	0	0	3	12	
30, 12 m.........	1	8	2	6	....	....	1	8	Spots probably disappeared by solar rotation.

‡Approximated. Faculæ were seen at the time of every observation.

Mr. William Dawson, at Spiceland, Ind., reports: 1st, 8 groups, 33 spots; 4th, 6 groups, 56 spots; large group of small spots in northeast quadrant and large spot east of center; 5th, 7 groups, 60 spots; 11th, 8 groups, 36 spots; large group east of center; 12th, 7 groups, 65 spots; several large groups east of center; 5 of the spots very large; several others quite prominent; very large spot and prominent penumbra at east edge; air very poor; 13th, 5 groups, 65 spots; the large spot is 1′ from east edge; 14th, 7 groups, 75 spots; 1 spot quite large; many others quite prominent; air poor; 15th, 9 groups, 140 spots; 1 very large group in southwest quadrant; the eastern group easily seen without telescope; 16th, 8 groups, 160 spots, 12 of which are large and 12 others quite prominent;

17th, 9 groups, 175 spots; 2 very large groups south of center; 1 easily seen without telescope; 6 groups, 95 spots; 1 visible without glass; 24th, 3 groups, 35 spots; 1 large group has disappeared; 1 large spot west of center; 25th, 3 groups, 30 spots; 27th, 5 groups, 25 spots; 28th, 3 groups, 20 spots, all of which are small; 30th, 3 groups, 18 spots. Mr. David Trowbridge, at Waterburgh, N. Y., reports: 3d, 6 groups, 12 spots; faculæ in west; 7th, 7 groups, 12 spots; faculæ in east; 15th, 7 groups, 22 spots, several of which are large; 1 group in east easily seen without telescope; 1 large group in west; 16th, 7 groups, 25 spots; 1 group has disappeared and 1 appeared by rotation. There are visible 10 spots included in one penumbra in the large group which is still plainly visible without telescope; it occupies fully one-fifteenth of the solar diameter; 17th, 6 groups, 22 spots; 1 group has disappeared and another is very faint; the large group still seen with unassisted eye; 18th, 6 groups, 26 spots; 1 group has appeared and 1 has disappeared by rotation; 2 groups now visible without telescope; 22d, 4 groups, 7 spots; the 2 large groups near west margin are no longer visible without telescope, 1 of which was visible for 6 days without aid of glass; 23d, light groups, 12 spots; 24th, 4 groups, 7 spots; 1 large group has disappeared by rotation; 25th, 3 groups, 7 spots; faculæ near the large group and in the east; 26th, 2 groups, 4 spots; large group has disappeared by rotation; 29th, 1 group, 1 spot; faculæ; 30th, 1 group, 3 spots; faculæ in east. Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: Sun spots were observed one very clear day during the month; they were largest and most active from 15th to 21st; smallest and least numerous on 29th and 30th; the groups and spots were exceedingly large from 17th to 19th.

The following record of observations has been forwarded by Mr. A. G. Bender, Sacramento, Cal.: 4th 2 p. m., 4 groups, 15 spots ; 2 new groups, 9 spots, appeared since the 31st ultimo ; 4th and 5th, 4 groups, 15 spots ; 11th, 2 p. m. 6 groups, 25 spots ; 1 new group, 9 spots ; 1 group, 1 spot reappeared by rotation; 12th, 4 p. m., 6 groups, 35 spots; 1 group, 5 spots, has disappeared by rotation and 1 group, 5 spots, has reappeared by rotation; 13th and 14th, 6 groups, 40 spots; 15th, 4 p. m., 7 groups, 45 spots; 1 new group, 1 spot; 16th, 4 p. m., 6 groups, 40 spots; 1 group, 1 spot has reappeared by rotation, and 1 group, 1 spot has disappeared; 17th, 3.30 p. m., 6 groups, 45 spots; 1 new group, 3 spots; 1 group 1 spot has disappeared by rotation; 18th, half-past three p. m., 6 groups, 40 spots; 20th, half-past three p. m., 5 groups, 40 spots, 1 group, 1 spot has disappeared by rotation; 21st, half-past three p. m., 6 groups; 1 new group, 1 spot; 22d, half-past three p. m., 6 groups, 40 spots; 23d, 4 groups, 35 spots; 1 group, 10 spots has disappeared by rotation; new spots have appeared in the old groups; 24th, half-past three p. m., 3 groups, 20 spots; 1 group, 10 spots has disappeared by rotation; 25th, half-past three p. m., 2 groups, 10 spots, some of which are faint; 1 group, 10 spots, has disappeared by rotation; 26th, 2 groups, 10 spots; 27th half-past three p. m., 1 group, 1 spot; 10 spots has disappeared by rotation; 28th, 2 groups, 3 spots, 1 new group, 2 spots; 29th, 1 group, 2 spots; 1 group, 1 spot has disappeared by rotation; 30th, 3.30 p. m., 1 new group, 6 spots; 1 group, 2 spots has disappeared by rotation. At all observations during the month, when 10 or more spots have been reported, the number given is estimated. At Winnemucca, Nev., 20th, 2 large spots were observed on the sun through an ordinary marine glass. They were also visible on 21st, Cincinnati, 17th. Professor Stowe, of the Cincinnati Observatory, reports that the largest number of sun spots ever observed here were seen this morning, numbering 360 in 7 distinct groups, 2 of which could be seen with the unassisted eye. They could also be seen without the aid of the telescope on the 19th.

The following report was made by Mr. Arthur Binns, second officer on the steamship City of Paris, of the Inman Line, and furnished through the courtesy of the New York Herald Weather Service: At noon of April 22d, in 49° 03′ N., 22° 00′ W., a black spot was observed on the sun's surface about 6′ from the southwest edge.

Meteors.—Rio Vista, Cal., 12th; Monticello, Iowa, 26th; Woodstock, Md., 16th; Protem, Mo., 6th; Somerville, N. J., 18th; Moorestown, N. J., 16th; North Volney, N. Y., 16th; North Lewisburgh, Ohio, 16th; Stateburgh, S. C., 10th, 20th; Cedar Keys, Fla., 14th; Yuma, Ariz., 5th, 28th. The following reports of a remarkable meteor were received too late to appear in the March Review:

Fort Assinniboine, Mont., March 8th, 8.30 p. m., an enormous meteoric stone fell southeast of station, lighting up the surrounding country as if caused by a vivid flash of lightning. Upon striking the earth a violent jar was felt resembling an earthquake shock, which was followed by a loud report like that of a cannon. The interval between the shock and report is variously estimated from four to eight minutes. At Fort Benton, Mont., about 10 p. m., a shock like that produced by an earthquake was felt. At Coal Banks, Mont., a bright glare was observed, followed a few minutes later by a loud report. A trembling of the earth was distinctly felt.

Migration of birds.—*Geese flying northward:* Somerset, Mass., 2d, 14th, 26th; Fall River, Mass., 8th; Newport, R. I., 30th; Clear Creek, Nebr., 17th, 20; Moorestown, N. J., 12th; Readington, N. J., 23d; Embarrass, Wis, 29th, 30th; Shreveport, La., 23d; Grand Haven, Mich., 19th; Port Huron, Mich., 29th; Fort Yates, Dak., 1st; Bismarck, Dak., 15th;

Huron, Dak., 2d, 3d, 4th; Springfield, Mass., 3d; Red Bluff, Cal., 14th, 21st, 22d. *Geese flying southward:* Fort Missoula, Mont., on the 11th. *Cranes flying northward:* Monticello, Iowa, on the 2d. *Sandbills flying northward:* Monticello, Iowa, 2d. *Ducks flying northward:* Monticello, Iowa, 2d; Lansing, Mich., 1st; Indianola, Tex., 29th; Des Moines, Iowa, 29th; Huron, Dak., 2d, 3d, 20th.

Polar bands.—New Corydon, Ind., 1st, 3d, 12th, 18th, 21st, 23d, 24th, 25th, 27th, 28th; Dana, Iowa, 21st; Fayette, Miss., 8th; Freehold, N. J., 22d; Vineland, N. J., 15th; Wytheville, Va., 10th, 12th, 27th, 28th; Florence, Ariz., 10th, 12th.

Zodiacal light.—New Corydon, Ind., 15th, 16th; Monticello, Iowa, 11th, 14th, 26th; Yates Center, Kans., 16th; Cornish, Me., 17th; Fall River, Mass., 17th; Cambridge, Mass., 5th, 7th, 8th, 12th, 16th, 17th, 18th, and suspected on the 23d; Atco, N. J., 8th; 12th, 13th, 16th, 17th, 18th; Franklin, Wis., 14th; Lynchburgh, Va., 16th; Nashville, Tenn., 8th, 16th, 17th; Leavenworth, Kans., 16th; Dayton, Wash., 6th, 11th, 17th.

Waterspouts.—Captain N. S. Tracy, of the American brig Teneriffe, reports: April 30, in 32° 31′ N., 77° 17′ W., saw several waterspouts.

Earthquakes.—Portland, Oreg., 30th, 10.48 p. m., a slight shock of earthquake lasting about two seconds, followed about three seconds later by a more severe shock accompanied by a low rumbling sound of from five to seven seconds duration. Every building in the city was shaken and persons sleeping were aroused. In the larger buildings the shock was more sensibly felt. The direction of the wave seemed to be from a point north of east to a point south of west. The shock was by far the most severe ever felt in this city. No damage was done other than the excessive fright caused. It is reported from Oregon City, that two distinct shocks were felt at that place, one being very slight and the other heavy; and at 12.25 a. m. of May first, another slight shock was felt.

Olympia, Wash., 30th, 10.50 p. m., severe earthquake shock; wave seemed to be from west to northwest, followed by a succession of tremblings, lasting six or eight seconds, and then by a heavy shock, almost throwing persons from their feet; large trees were swayed to and fro as from a heavy blast of wind; clocks were stopped and crockery broken; two chimneys in the city were thrown down. The ground seemed to have an undulatory motion. Duration of the entire shock was about twenty-five seconds. Fort Canby, Wash., 30th, 10.50 p. m., four distinct earthquake shocks were felt at this place, lasting about fifteen seconds; vibration from southwest to northeast. Victoria, British Columbia, 30th, 10.45 p. m., a shock of earthquake lasting several seconds was felt at this place; vibration from west to east.

San Francisco, Cal., 13th, 6.30 a. m., a sharp earthquake shock, of a vibratory motion from north to south, was felt in this city, lasting about four seconds.

New Market, Va., 2d, several earthquake shocks were felt in this section; the direction of movement being northeast and southwest; some of the houses were perceptibly shaken.

Prairie and forest fires.—Alexandria, Dak., 10th, to 15th; Monticello, Iowa, 7th; Creswell, Kans., 7th, 8th, 12th to 15th, 20th, 24th, 26th, 29th; Protem, Mo., 3d and 21st; De Soto, Nebr., 14th, 25th; Wytheville, Va., 19th; Fort Gibson, Ind. T., 4th, 5th, 6th, 11th, and 14th; Moorhead, Minn., 15th, 28th; Yankton, Dak., 1st, 13th, 24th, 26th; Tobacco Garden, Dak., 1st, 4th; Ferry's Landing, Mont., 1st, 3d, 12th, 13th, 21st; North Platte, Nebr., 9th, 18th, 25th.

Drought.—Indianola, Tex., 26th, crops are suffering from drought; flower and vegetable gardens are seriously affected. Coleman City, Tex., 21st, the wheat crop in this section has been destroyed by drought; farmers are cutting it to be used for hay. Henrietta, Tex., drought is seriously affecting crops; farmers fear that their entire crop will be a failure unless the drought soon ends.

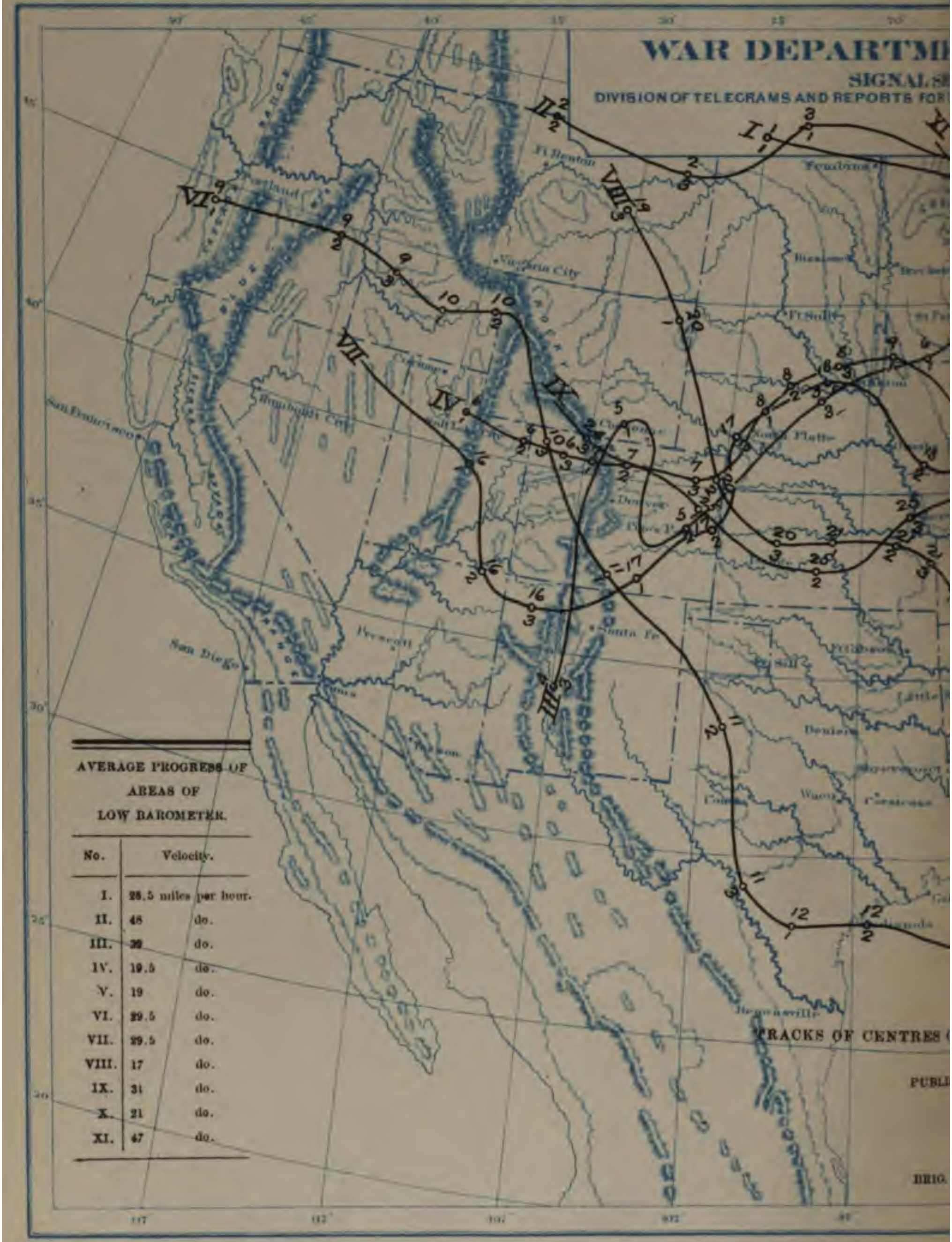
Insects.—Lewiston, Idaho, 2d, grasshoppers are appearing in this vicinity in large numbers. Little Rock, Ark., 2d, a small insect called the buffalo gnat, which appears to come out of the ground, especially in the prairie and swamp lands, have appeared in the city in great numbers and are very troublesome; they are most annoying and do the most damage near the overflowed districts, where it is necessary for owners of stock to build fires through the forest for protection. Horses and cattle will stand in dense volumes of smoke to avoid the bite of the insect; much stock has been killed by them within the past few days, and deer suffer from their ravages.

Sand-storms.—Fort Yuma, Cal., 6th, 9th, 10th, 16th, 17th, 20th; Fort Garland, Colo., 6th; Fort Stanton, N. Mex., 5th, 6th, 7th, 8th, 21st; Clear Creek, Nebr., 3d; Stockton, Tex., 21st; Phœnix, Ariz., 6th, 10th, 13th, 15th, 16th, 20th; Santa Fé, N. Mex., 16th; Camp Thomas, Ariz., 3d, 4th, 6th, 7th, 10th, 11th, 14th, 16th, 17th, 20th, 21st, 29th, 30th; Winnemucca, Nev., 15th, 19th, 22d, 23d, 24th; Umatilla, Oreg., 6th; Visalia, Cal., 2d; Yuma, Ariz., 3d, 6th, 9th, 10th, 16th, 20th, 21st; Lincoln, Nebr., 3d; severest sand-storm that has been known in this State for many years.

Published by order of the Secretary of War.

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

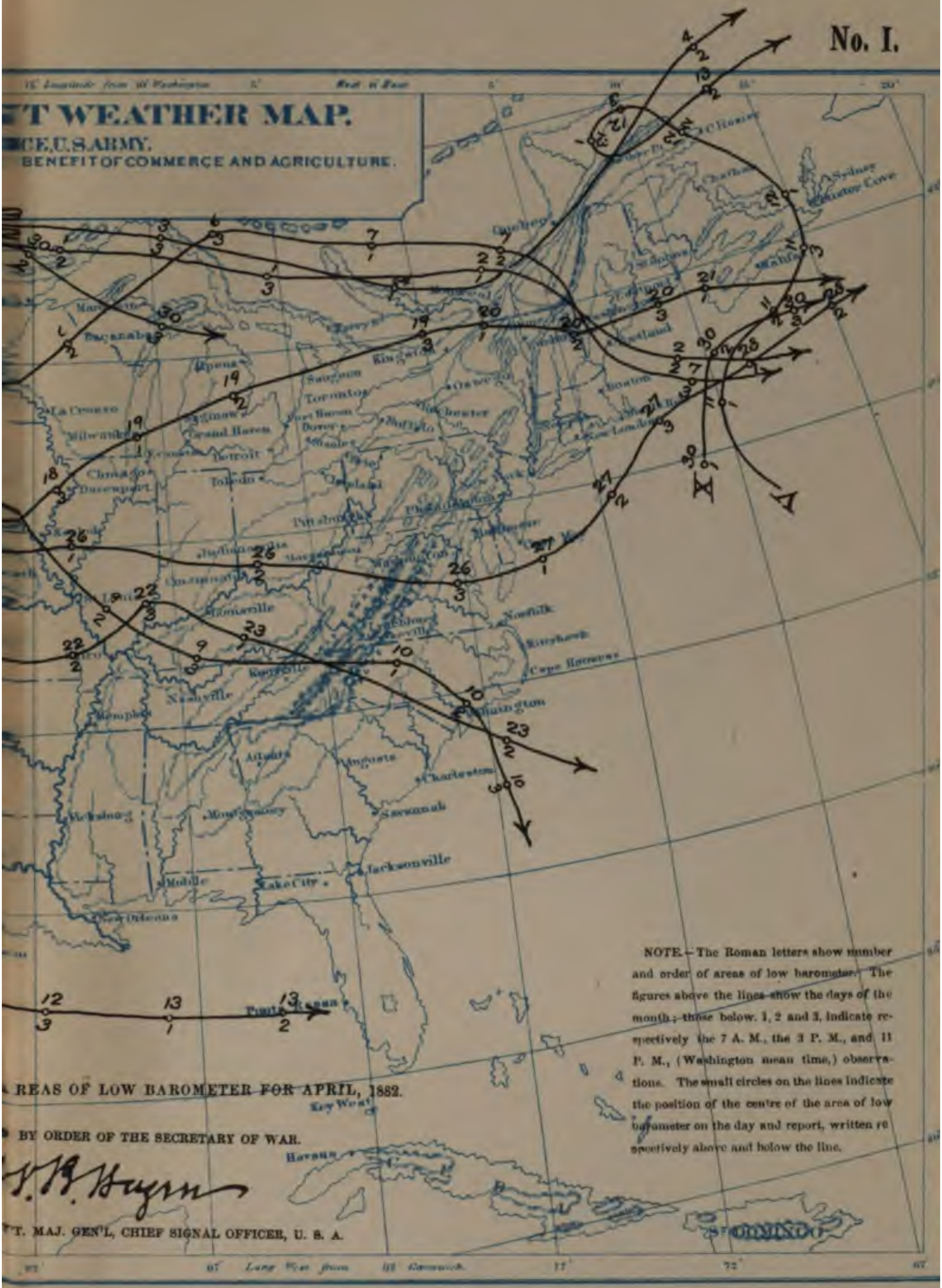
46



AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.

No.	Velocity.	
I.	28.5 miles per hour.	
II.	48	do.
III.	30	do.
IV.	19.5	do.
V.	19	do.
VI.	29.5	do.
VII.	29.5	do.
VIII.	17	do.
IX.	31	do.
X.	21	do.
XI.	47	do.

No. I.



T WEATHER MAP.

CE,U.S.ARMY.

BENEFIT OF COMMERCE AND AGRICULTURE.

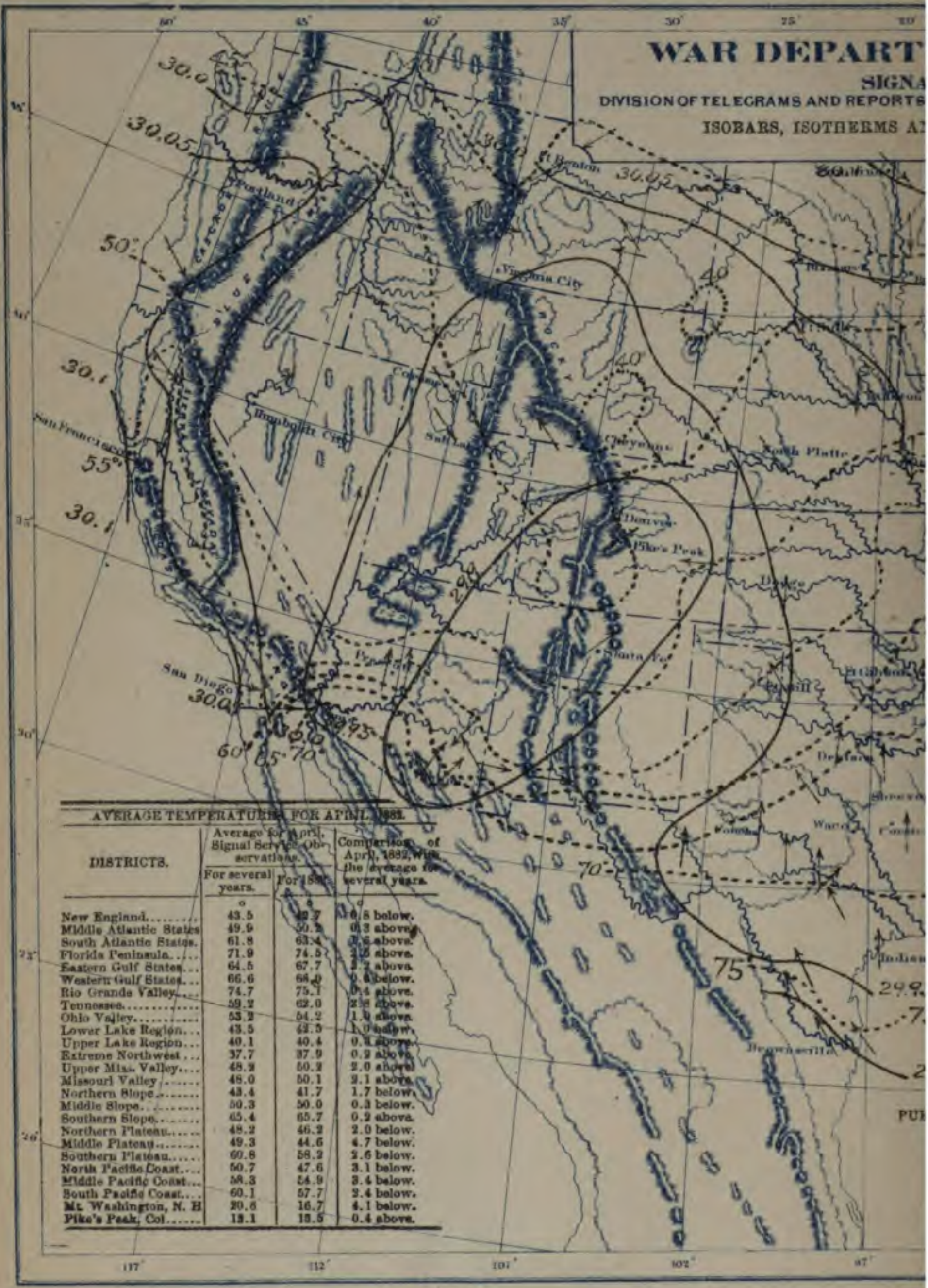
REAS OF LOW BAROMETER FOR APRIL, 1882.

BY ORDER OF THE SECRETARY OF WAR.

B. Hazen

T. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below. 1, 2 and 3, indicate respectively the 7 A. M., the 3 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.



WAR DEPART

SIGNA

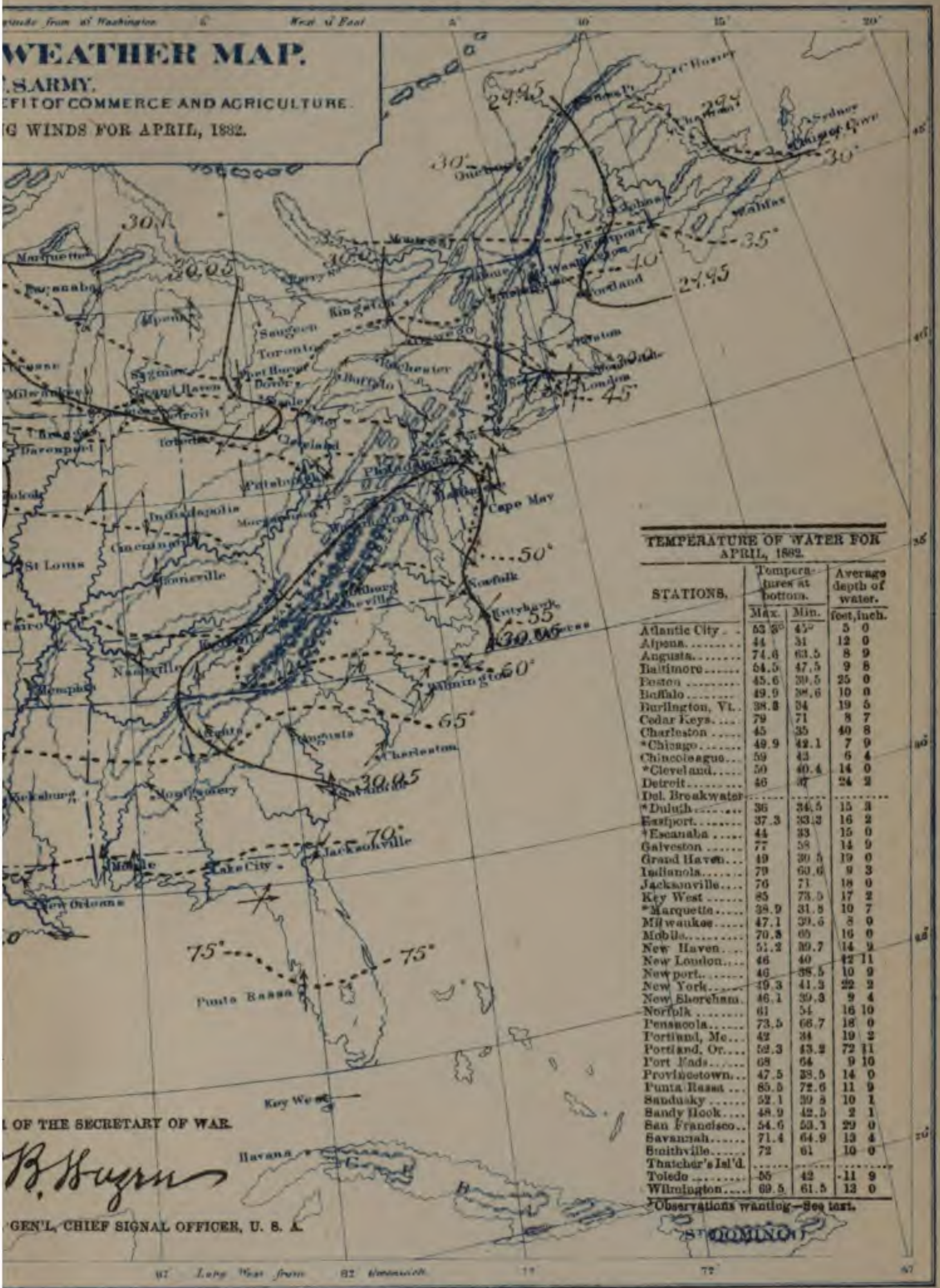
DIVISION OF TELEGRAMS AND REPORTS

ISOBARS, ISOTHERMS A

AVERAGE TEMPERATURES FOR APRIL, 1882.

DISTRICTS.	Average for April, Signal Service Observations.		Comparison of April, 1882, with the average for several years.
	For several years.	For 1882.	
	°	°	°
New England	43.5	42.7	0.8 below.
Middle Atlantic States	49.9	50.2	0.3 above.
South Atlantic States.	61.8	63.4	1.6 above.
Florida Peninsula	71.9	74.5	2.6 above.
Eastern Gulf States	64.5	67.7	3.2 above.
Western Gulf States	66.6	66.0	0.6 below.
Rio Grande Valley	74.7	75.1	0.4 above.
Tennessee	59.2	62.0	2.8 above.
Ohio Valley	53.2	54.2	1.0 above.
Lower Lake Region	43.5	42.5	1.0 below.
Upper Lake Region	40.1	40.4	0.3 above.
Extreme Northwest	37.7	37.9	0.2 above.
Upper Miss. Valley	48.2	50.2	2.0 above.
Missouri Valley	48.0	50.1	2.1 above.
Northern Slope	43.4	41.7	1.7 below.
Middle Slope	50.3	50.0	0.3 below.
Southern Slope	65.4	65.7	0.2 above.
Northern Plateau	48.2	46.2	2.0 below.
Middle Plateau	49.3	44.6	4.7 below.
Southern Plateau	60.8	58.2	2.6 below.
North Pacific Coast	50.7	47.6	3.1 below.
Middle Pacific Coast	58.3	54.9	3.4 below.
South Pacific Coast	60.1	57.7	2.4 below.
Mt. Washington, N. H	20.8	16.7	4.1 below.
Pike's Peak, Col	13.1	13.5	0.4 above.

No. 11.



WEATHER MAP.

.S.ARMY.

EFIT OF COMMERCE AND AGRICULTURE.

G WINDS FOR APRIL, 1882.

OF THE SECRETARY OF WAR.

B. Hazen

GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

TEMPERATURE OF WATER FOR APRIL, 1882.

STATIONS.	Temperatures at bottom.		Average depth of water.	
	Max.	Min.	feet,	inch.
Atlantic City	53.3°	45°	5	0
Alpena	44	31	12	0
Augusta	74.6	63.5	8	9
Baltimore	54.5	47.5	9	8
Boston	45.6	39.5	25	0
Buffalo	49.9	38.6	10	0
Burlington, Vt.	38.8	34	19	5
Cedar Keys	79	71	8	7
Charleston	45	35	40	8
*Chicago	49.9	42.1	7	9
Chincoteague	59	43	6	4
*Cleveland	50	40.4	14	0
Detroit	46	37	24	2
Del. Breakwater	......	......	......	......
*Duluth	36	34.5	15	3
Eastport	37.3	33.3	16	2
*Escanaba	44	33	15	0
Galveston	77	58	14	9
Grand Haven	49	39.5	19	0
Indianola	79	60.6	9	3
Jacksonville	76	71	18	0
Key West	85	73.5	17	2
*Marquette	38.9	31.5	10	7
Milwaukee	47.1	39.5	8	0
Mobile	70.8	65	16	0
New Haven	51.2	39.7	14	9
New London	46	40	12	11
Newport	46	38.5	10	9
New York	49.3	41.3	22	2
New Shoreham	46.1	39.3	9	4
Norfolk	61	54	16	10
Pensacola	73.5	66.7	18	0
Portland, Me	42	34	19	2
Portland, Or.	52.3	43.2	72	11
Port Eads	68	64	9	10
Provincetown	47.5	38.5	14	0
Punta Rassa	85.5	72.6	11	9
Sandusky	52.1	39.8	10	1
Sandy Hook	48.9	42.5	2	1
San Francisco	54.6	53.1	29	0
Savannah	71.4	64.9	13	4
Smithville	72	61	10	0
Thatcher's Isl'd.	......	......	......	......
Toledo	55	42	11	9
Wilmington	69.5	61.5	13	0

*Observations wanting—See text.

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48

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APPENDIX No. 86.

MONTHLY WEATHER REVIEW, MAY, 1882.

INTRODUCTION.

This Review presents a general summary of the meteorological data collected by the Signal Service during the month of May, 1882.

In the preparation of this Review have been used, viz: The regular tri-daily weather charts, containing the data of simultaneous observations taken at 136 Signal Service stations and 13 Canadian stations, as telegraphed to this office; 183 monthly journals and 174 monthly means from the former, and 13 monthly means from the latter; 200 monthly registers from voluntary observers; 53 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald weather service; abstracts of ships' logs, furnished by the publishers of The New York Maritime Register; monthly reports from the local weather services of Kansas, Nebraska, and Missouri, and of the Central Pacific Railway Company; trustworthy newspaper extracts; special reports.

The more prominent meteorological conditions of the month have been:

1. The deficiency in temperature, which, except in California, has been in all the other States and Territories below the mean for the month, averaging 5° below in New England, the Middle Atlantic States, and Tennessee, 6° below in the Lake region and the Ohio Valley, and 7° below in the northwest.

2. The great excess of rainfall in the Ohio Valley, amounting to more than 4.5 inches, and in Tennessee and the lower lakes, amounting to nearly 3 inches. In Arkansas the rainfall has been unusually heavy (especially in the vicinity of Little Rock, where the amount exceeded 15 inches), but owing to lack of data from that section in previous years comparison cannot be made. The excessive rainfall and continued cold has had a depressing effect, it is reported, on the cotton crop, but from all States the prospects are very encouraging for fruits and cereals.

A new feature of the weather review is continued under the head of "Cotton region reports." The Chief Signal Officer began in April a system of daily telegraphic reports for the benefit of those interested in this staple, and the accompanying table gives the monthly mean of the maximum and minimum temperatures and the average rainfall for the month in the various cotton districts throughout the South.

That part of the Review referring to international meteorology presents the general weather conditions which prevailed over the northern hemisphere during the month of March, 1880, and the tracks of barometric minima for June, 1880, traced from simultaneous observations taken at 7.35 a. m., Washington mean time.

A large number of icebergs were encountered by vessels during the month. The comparison of Chart VII with that of April shows that the limits within which ice was observed did not extend as far southward and westward during the present month, but it still suggests the advisability of selecting the southern routes for vessels passing to and from Europe at this season of the year. Under the heading, "Ocean ice" will be found special reports giving the latitude and longitude in which icebergs were observed.

BAROMETRIC PRESSURE.

The mean barometric pressure for the month over the United States and Canada is shown by the isobarometric lines, in black on Chart II. The area of lowest mean pressure is central in Arizona and New Mexico. An area of high pressure, belonging to the high barometer of the Atlantic Ocean, extends over the Middle Atlantic and South Atlantic States. The barometer is highest on the coast of Oregon and Washington Territory. A comparison of this chart shows an approach to the usual distribution of pressure in summer, a low area covering the interior of the continent. Compared also with the previous month the pressure is slightly higher in New England, Saint Lawrence Valley, the Canadian maritime provinces, and in the North Pacific coast region, but is nearly one-tenth of an inch lower at stations in Montana, Dakota, and Minnesota, and thence to Arizona, New Mexico, and Northern Texas.

Departures from the normal values for the month.—Compared with the means of previous years, the pressure over the country east of the Mississippi River below the forty-third parallel of latitude and in Maine ranges from normal to 0.09 inch below the normal; in the Upper Lake region it is from 0.03 to 0.07 inch above the normal; in the Extreme Northwest and Upper Missouri Valley it ranges from 0.02 to 0.08 inch above the normal; in the West Gulf States and the North Pacific coast region it is about normal; at Rocky Mountain stations, from 0.02 to 0.05 inch below the normal; and in Southern California it is slightly above the normal.

Barometric ranges.—The range of pressure during the present month has varied from 0.29 inch to 1.07 inches, the least range being at Key West, and the greatest at New London, Conn. In the several districts the barometric ranges have been as follows: *New England:* From 0.76 inch on summit of Mount Washington to 1.04 inches at New Shoreham. and 1.07 inches at New London. *Middle Atlantic States:* From 0.82 inch at Lynchburgh and 0.83 inch at Williamsport to 1.01 inches at Barnegat and Sandy Hook and 1.03 inches at New York. *South Atlantic States:* From 0.48 inch at Jacksonville to 0.80 inch at Hatteras and 0.82 inch at Kitty Hawk. *Florida Peninsula:* From 0.29 inch at Key West to 0.41 inch at Cedar Keys. *East Gulf States:* From 0.48 inch at New Orleans to 0.62 inch at Starkville, Miss. *West Gulf States:* From 0.47 inch at Port Eads to 0.77 inch at Denison and 0.82 inch at Fort Gibson. *Rio Grande Valley:* From 0.61 inch at Brownsville to 0.83 inch at Eagle Pass. *Ohio Valley and Tennessee:* From 0.64 inch at Memphis and 0.66 inch at Chattanooga to 0.82 inch at Pittsburgh. *Lower Lake region:* From 0.81 inch at Sandusky and 0.82 inch at Erie and Toledo to 0.87 inch at Buffalo, Detroit, and Rochester. *Upper Lake region:* From 0.57 inch at Duluth and 0.62 inch at Marquette to 0.91 inch at Port Huron and 0.96 inch at Alpena. *Extreme Northwest:* From 0.62 inch at Fort Buford to 0.82 inch at Bismarck. *Upper Mississippi Valley:* From 0.70 inch at Cairo to 0.83 inch at Keokuk and 0.84 inch at Springfield, Ill. *Missouri Valley:* From 0.73 inch at Springfield, Mo., to 1.03 inches at Fort Bennett, Dak. *Northern Slope:* From 0.58 inch at Fort Assinaboine and 0.59 inch at Fort Keogh and Fort Washakie to 0.99 inch at North Platte. *Middle Slope:* From 0.58 inch on the summit of Pike's Peak to 0.90 inch at Dodge City. *Southern Slope:* From 0.49 inch at El Paso to 0.80 inch at Jacksborough and 0.83 inch at Henrietta. *Southern Plateau:* From 0.37 inch at Camp Thomas to 0.60 inch at Santa Fé. *Middle Plateau:* From 0.43 inch at Pioche to 0.55 inch at Winnemucca. *Southern Plateau:* From 0.49 inch at Eagle Rock to 0.80 inch at Umatilla and 0.81 inch at Fort Missoula. *North Pacific Coast region:* From 0.58 inch at Roseburgh to 0.71 inch at Olympia and 0.72 inch at Portland. *Middle Pacific Coast region:* From 0.41 inch at San Francisco to 0.46 inch at Red Bluff. *South Pacific Coast region:* From 0.35 inch at Campo to 0.49 inch at Yuma.

AREAS OF HIGH BAROMETER.

Five well-defined areas of high barometer have appeared within the limits of the chart for the month of May, 1882. These areas have pursued a general track to the south of east; two were first noted in the northwest; one over the lake region and pressing southward; one in the maritime provinces of Canada, and the fifth in Washington Territory and Oregon. An examination of the chart of areas of low barometer (Chart No. I) shows the great influence exercised by high area No. II in stopping the progress of storm-center No. I; also of the influence of high area No. III in delaying the movement of storm-center No. II for three days in the Ohio Valley.

I.—On the 1st there was a sharp rise in barometric pressure in the northwest and in the upper lake region. This high area was situated between a low area in the maritime provinces of Canada and a great depression entering the North Pacific coast region. On the 2d the high barometer moved slightly to the south of east over the lake region and Ohio Valley to the Middle Atlantic coast; at the midnight observation of this day fair or clear weather was reported from all stations east of the Mississippi River. At the morning observation of the 3d the isobar of 30.4 included Lynchburgh, Washington, Chincoteague, and Baltimore; during the day there was a general fall of pressure east of the Rocky Mountains, the sharpest fall being in the lake region and New England, and at the midnight report the highest isobar, 30.1, included the South Atlantic States. During the fourth this high barometer disappeared from the chart in advance of low area I, then entering Kansas, Colorado, Iowa, and Missouri. During the progress of this high area from Dakota to the Atlantic coast, the pressure at the center of the high barometer averaged 0.3 inch above the mean for the month.

The minimum temperatures for the month are associated with this area, in the northwest, lake region, Ohio Valley, Middle States, and New England. Cautionary off-shore signals ordered on the second, in connection with this high pressure, from Sandy Hook to Chincoteague were justified by the following velocities: Chincoteague, 29, NW.; Delaware Breakwater, 40, NW.; Cape May, 36, NW.; Barnegat, 32, NW.; Sand Hook, 36, NW. Cautionary signals were displayed on the second on the North Carolina coast, and the following maximum velocities were reported: Macon, 32, E.; Hatteras, 44, NE.; Kittyhawk, 41, NE.; Cape Henry, 27, N.

II.—On the 4th, during the march of low area I over Kansas and Missouri, there was a sharp rise of pressure over the northern portion of the lake region, accompanied by brisk to high northeasterly winds, light rain, and a decided fall in temperature. On the 5th this high area, which barred the natural track of depression I, pressed steadily to the southward, with a rise averaging 0.3 inch in the northwest and 0.2 inch in the lake region, Middle States, and New England, with a marked fall of temperature in the same districts, the thermometer being nearly 20° below the mean for the month. On the 6th, the high barometer extended over the lake region, Middle States, and New England; on this day low area I, which had entered Illinois, was filled up by the inflowing air and ceased to exist as a depression; in the mean time a new depression, low area II, was developing in the Rio Grande Valley.

On the 7th, the region of highest barometer was transferred to the Middle Atlantic States, which were inclosed by the isobar of 30.4, as well as Connecticut and Rhode Island; the pressure in the upper lakes yielding in the mean time before the advance of low area II. On the 8th, during a sharp fall of mercury in the Middle States and New England, the high area was transferred to the South Atlantic States, and on the 9th this area disappeared before the advance of low area II, which had begun to recurve to the eastward and was then central in the northwest. In connection with the steep barometric gradient existing between this high area and low area I, cautionary signals were ordered for the lake region, and the following maximum velocities were reported: Erie, 27, NE.; Sandusky, 37, NE.; Toledo, 54, E.; Port Huron, 41, NE.; Chicago, 27, NE.; Milwaukee, 32, N.

III.—On the 10th, the barometer rose 0.3 inch in the maritime provinces while low area No. II was entering the lower lake region. On the 11th the pressure continued rising, and the increase of pressure extended over New England and the Middle Atlantic States, delaying the advance of depression II to the eastward. On the 12th the barometer remained high in the same region, and during its continuance on the 10th, 11th, and 12th, low area II remained nearly stationary in the Ohio Valley. On the 13th the high area disappeared to the eastward beyond the limits of the chart.

IV.—On the 10th, the pressure rose 0.4 inch in Minnesota in rear of low area II, then entering the lake region. On the 11th the rise extended over Manitoba and all the Northwest and Upper Lake region, the highest barometer reported, 30.34, at Fort Garry, being 0.4 inch above the normal for the month. On the 12th, the highest barometer remained central over Manitoba and Minnesota, but the pressure rose over all the region from the lakes to the South Atlantic and Gulf coasts. On the 13th the high pressure maintained nearly the same location, remaining about 0.3 inch above the normal for the month. On the 14th and 15th, the barometer rose in all the States east of the Mississippi River, although the pressure still continued highest in the Northwest and Lake region. On the 16th the center of high barometer moved to Illinois and Indiana; at the midnight observation, unusually clear weather prevailed in all the States. On the 17th there was a rapid transfer of the highest pressure to the maritime provinces of Canada, the highest readings at the midnight observation being Farther Point and Chatham, 30.44 or 0.53 inch above the normal. Also at this observation the barometer, except in a slight portion of the Extreme Northwest, was in all the United States above the mean for the month. On the 18th the pressure still continued rising in the maritime provinces, the highest barometers reported being Farther Point, 30.58; Chatham, 30.59; Halifax, 30.55; Sydney, 30.6. It is worthy of note that although there was an area of low barometer in Dakota and Minnesota, fair weather prevailed in all the country east of the Mississippi River except along the New England coast, where cloudy weather with brisk to high northeast winds and light rain were reported. The distribution of pressure observed in the maritime provinces and New England, giving a barometric gradient producing northeasterly winds, is generally accompanied by rain, first beginning along the coast and then extending inland. On the 19th there was a general decrease of pressure in all the districts, although the barometer still continued highest in Nova Scotia. On the 20th this area, the most important of the month, ceased to exist as a high pressure. In connection with this area and low area II, the minimum temperatures for the month generally occurred in the South Atlantic, Gulf States, and Tennessee.

V.—On the 18th there was a marked increase of pressure in Washington Territory and Oregon; on the 19th the increase extended into Idaho; on the 20th the highest pressure was central in Montana, where the barometer averaged 0.4 inch above the mean for the month. On the 21st the high area moved into Dakota, and on the 22d, moved by a southeasterly course into Iowa and Missouri; 23d, the highest pressure was central in Illinois; on the 24th, it was very rapidly transferred to the Middle Atlantic coast in advance of a rain-area approaching from the west, and on the succeeding day it ceased to prevail as a high area.

Areas of low barometer.—Four areas of low barometer have appeared within the limits of, or approached the stations of observation during the month, which were sufficiently well defined to render it possible to approximately determine the positions of the centers at consecutive telegraphic reports. The tracts of the centers of these depressions are exhibited on Chart I. Compared with May of previous years, the barometric disturbances have been less than the average for May.

The following table shows the number of areas of low barometer occurring during the month of May since 1874, as traced on Chart I of The Monthly Weather Review:

May, 1874	8
May, 1875	11
May, 1876	11
May, 1877	5
May, 1878	13
May, 1879	14
May, 1880	10
May, 1881	5

The following table gives the latitude and longitude in which each area was first and last observed during the month of May, 1882, with the average hourly velocity:

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	46 0	124 0	39 0	88 0	19.0
No. II	29 0	102 0	40 0	72 0	17.0
No. III	44 0	123 5	46 5	61 0	30.0
No. IV	46 5	108 0	45 0	78 5	20.5

The storm tracks of the present month are in general to the north of those of the preceding month, which was to be expected. The track of low area II is in the earlier portion of its course very unusual for May, as in that month storms seldom develop south of latitude 85° N. Perhaps the most remarkable feature of these storm areas is the influence exerted by areas of high pressure in absolutely checking the progress of low area I, and of delaying depression II for two days in the Ohio Valley, as will be seen more fully set forth in the detailed description of these storm centers.

I.—On the 1st, a great depression, moving in an easterly track, entered Washington Territory and Oregon, the lowest barometer readings averaging 0.35 inch below the mean for the month. On the 2d, the low area continued its easterly course accompanied by light rains in Idaho and Montana. One the 3d, the movement of the center of depression was not well-defined, but it evidently took a southerly path; at the morning report of the 4th the center was in Kansas; during the day the storm area moved with an increase of energy to Eastern Kansas. At midnight the lowest barometers observed were: Leavenworth, 29.48; Des Moines, 29.51; Omaha, 29.54, being below the normal pressure for the month 0.46, 0.45, and 0.4 inch, respectively. Thunder-storms were reported from the Ohio Valley, Illinois, Indiana, Missouri, and Arkansas. On the 5th, the storm center moved slowly to the east into Illinois, but its progress was checked by high area II, which was then entering the Lake region. The following heavy rainfalls were reported, in inches, during the prevalence of this storm: Champaign, 3.6; Springfield, Ill., 3.57; Des Moines, 2.81; Cedar Rapids, Iowa, 3.25. On the 6th, the center of low area was filled up by the in-flowing air from the high pressure in the Lake region. The maximum temperatures for the month in the Lower Missouri Valley, Indian Territory, and Northwestern Texas were associated with this low area.

II.—On the 4th the pressure was below the mean in the Rio Grande Valley, and continued slowly decreasing until, at the midnight observation of the 6th, a storm of considerable energy was developed; the barometer at Eagle Pass, 29.38, was 0.53 inch below the normal. At this hour the distribution of pressure should be noted, as it will probably account for the anomalous direction of the movement of the storm center on the 7th and 8th. The pressure averaged 0.2 inch above the mean in the Lake region, Middle Atlantic States, and New England, and 0.3 inch above the mean in the Saint Lawrence Valley, thus presenting an obstacle to the natural course of the low area to the Northeast. At the same time the pressure was about 0.25 inch below the mean in New Mexico, Colorado, and Wyoming, and the depression for the next two days followed very nearly the path of least resistance. On the 7th the storm center, increasing in energy, moved to the northward, as charted, the lowest barometric readings reported being: Dodge City, 29.3; North Platte, 29.36; below the normal, respectively, 0.57 and 0.53 inch. During the day the pressure increased along the Alantic coast, being nearly 0.4 inch above the mean in the Middle Atlantic States and New England, and decreased 0.4 inch in Nebraska. On the 8th, the storm center moved slowly to the northward, the lowest barometer reported being, at the morning observation at North Platte, 29.2, or 0.7 inch below the normal. While the storm center was moving on the 8th over Nebraska and into Dakota, there was a general decrease of pressure in the Lake region, Saint Lawrence Valley, Middle Atlantic States, and New England, and when this storm area recurved to the eastward, as shown by the morning report of the 9th, the pressure was below the mean in all the districts just mentioned. On the 9th and 10th the depression moved in a southeasterly course and became central in Ohio, where the lowest pressures were 0.4 inch below the mean for the month; during these two days the barometer rose in the maritime provinces and New England, and at the midnight report of the 10th a high pressure barred the natural track of the low area. For the next two days the storm center remained nearly stationary in the States of Indiana, Ohio, and Kentucky, while the barometer remained high in Canada and New England, and below the mean in all the Southern States. General rains were reported from the Northwest, Lake region, Ohio Valley, Tennessee, Middle Atlantic States, and New England. On the 13th, at the morning observation, the center of depression was near Cincinnati, and during the day it moved, but with diminished energy, to the North Carolina coast. On the 14th, the low area pursued, showing but slight energy, a northeasterly track along the coast and beyond the limits of the chart. During the passage of the area the maximum temperatures for the month were reported, generally in Maryland, Virginia, North Carolina, South Carolina. Cautionary signals displayed on the Atlantic coast for this storm were generally justified by the following maximum velocities: Boston, 26, NE.; Block Island, 48, NE.; New London, 25, NE.; New Haven, 30, NE.; New York, 42, NE.; Sandy Hook, 47, E.; Barnegat, 48, E.; Atlantic City, 48, E.; Cape May, 41, NE.; Delaware Breakwater, 58, E.; Chincoteague, 28, NE.; Cape Henry, 36, NE.; Kittyhawk, 30, N.; Hatteras, 34, SW. The following vessel-reports, furnished through the co-operation of the New York Herald Weather Service and the co-operating observers of the merchant marine probably indicate the presence of this storm during its passage eastward over the ocean: 14th, steamship Seminole, in N. 38° 26′, W. 74° 35′, barometer 29.50, fresh NE. wind, rainy; steamship Ohio, in N. 30° 29′, W. 64° 52′, 29.47, SSE., overcast, rainy; 20th, steamship Holland, in N. 43° 00′, W. 45° 21′, strong NW. gale, heavy beam sea.

III.—On the 21st, the pressure fell below the mean on the coasts of Washington Territory and Oregon, and continued slowly falling until the midnight observation of the 24th; on the 25th, the center of depression moved in a southeasterly track into Northwestern Colorado, accompanied by light rains in its southern quadrant. On the 26th it continued a southeasterly course into Northern Texas. The southeasterly course of this depression during the 25th and 26th is not an unusual one for areas of low barometer crossing the Rocky Mountains; but after the midnight observation of the 26th the storm center pursued the more usual course to the northeast, moving on the 27th into the Ohio Valley, from which region severe thunder-storms were generally reported. On the 28th the area of lowest pressure extended in an elliptical form over the Middle and South Atlantic States and Tennessee and the Ohio Valley, and heavy rains and severe thunderstorms were reported from all those districts. On the 29th the storm center moved along the New England coast and beyond the limits of the chart. On this day occurred the lowest barometric readings observed during this depression: Block Island and Provincetown, 29.57; Portland, 29.55; Eastport and Chatham, 29.56; Anticosti, 29.46. Cautionary signals, ordered for this storm on Lakes Michigan and Erie, were justified only at scattering stations. The following reports furnished through the co-operation of the New York Herald Weather Service, probably indicate the presence of this storm during its passage eastward over the ocean: 30th, steamship W. A. Scholten, in N. 41° 21′, W. 53° 19′, barometer 29.55, NW., force 5, rough sea; steamship Lepanto, in N. 43° 29′, W. 44° 53′, strong south wind, force 6, overcast and rain.

IV.—At the afternoon report of the 29th a depression was developed in Dakota. On the 30th it moved slowly over Minnesota, with light rains reported from all stations in the Northwest and Upper Lake region; the lowest pressure reported was at Saint Paul, 29.52, or 0.41 inch below the normal. On the 31st the storm center pursued, with a considerable increase of energy, an easterly track over Lakes Michigan and Huron. It was during the progress of this low area that the maximum temperatures for the month was reported from the Lower Lakes and the Middle Atlantic States. Cautionary signals were ordered for this storm on Lake Erie, the following maximum velocities being reported: Cleveland, 28, SW.; Sandusky, 36, NW.; and on the Atlantic coast, Hatteras, 52, SW.; Kitty Hawk, 40, SW.; Delaware Breakwater, 40, SW.; Cape May, 40, S.; Atlantic City, 28, S.; Barnegat, 29, S.; Sandy Hook, 29, SW.; New London, 28, SW.; Newport, 31, S.; Provincetown, 32, S.

HURRICANE CHART.

Chart VIII exhibits the tracks of some of the more memorable tropical hurricanes of the West Indies that have been observed since the establishment of the Signal Service. The following letter, published in connection with this chart, explains the intention of the Chief Signal Officer to provide for a more extensive and elaborate system of storm warnings with respect to the tropical hurricanes which may menace our coasts:

WASHINGTON CITY, *June* 17, 1882.

Captain ——— ———.
Commanding Steamship ———,
(*Care of* ———):

SIR: I have the honor to inform you that the following Signal Service observers, stationed in the West India Islands, have *special* instructions to be vigilant during the hurricane season to obtain timely notice of hurricanes and telegraph the information to this service, for the benefit of the shipping interests of the North Atlantic and Gulf coasts:

Mr. A. Van Coneghan, Havana, Cuba;
Mr. ——— ———, St. Thomas, St. Thomas;
Mr. Edwin Racker, Bridgetown, Barbadoes;
Mr. Maxwell Hall, Kingston, Jamaica;
Mr. Robert Mason, Santiago de Cuba, Cuba;
Mr. L. V. Bigard, Pointe-à-Pitre, Guadeloupe.

You are also informed that the State Department has been requested to instruct its consular officers and agents, at the points named below, to telegraph promptly to the United States notice of hurricanes, when reported to them by ship-masters:

Cienfuegos, Cuba; Kingston, St. Vincent; San Juan, Porto Rico; St. Johns, Antigua; Port-of-Spain, Trinidad; St. George, Grenada; Roseau, Dominica; St. Pierre, Martinique.

The Chief Signal Officer requests, in case you encounter a hurricane or have knowledge of a hurricane then existing, that you will, on entering any of the ports before mentioned, communicate at once your information to the representative of the United States Signal Service, so that timely warning may be given, on the seaboard of the United States, of approaching danger. The information, even if several days old, may be very valuable.

The hurricane reported last August north of St. Thomas was five days in reaching the Georgia and South Carolina coasts; and the disastrous hurricane of August, 1873, was known on the 18th of August at St. Thomas, a week before the damage was done on the American coast, and on the 21st the residents of the Bermudas were fully aware of its existence, and could have foretold its track.

Thus, by timely warning from these outposts in the hurricane track, you may be the means, through the Signal Service of the United States, of averting danger and disaster; of saving life and property along our coasts; and of preventing vessels going to sea from sailing into the track of these dreadful storms.

Your co-operation is earnestly solicited in this important work. By it the Chief Signal Officer hopes to increase the efficiency of the storm-warning service along the Gulf and Atlantic coasts of the United States; in which all ship-masters, owners, agents, and underwriters have the greatest interest.

Herewith please find a chart on which are traced the paths of some of the most prominent tropical hurricanes of the West Indies that have prevailed since the establishment of the Signal Service of the United States.

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

INTERNATIONAL METEOROLOGY.

International Charts IV and V accompany the present number of this Review. Chart IV is published for March, 1880, and continues the series of that chart begun in January, 1877. Chart V is prepared for June, 1880, and continues the series of that chart from November, 1877. In the description of these charts much valuable information has been obtained from the Monatliche Uebersicht der Witterung, published under the direction of Prof. Dr. G. Neumayer, director of the German Marine Observatory, and from the Bulletin Mensuel, published by Mr. Marc. Dechrevens, of Zi-Ka-Wei, China.

Chart IV exhibits the mean pressure, mean temperature, and prevailing direction of the wind over the northern hemisphere for the month of March, 1880, as determined from one observation taken each day at 7.35 a. m. or 0.43 p. m., Greenwich mean time.

The first area of mean low barometer appears over the eastern coast of Greenland, the mean pressure at Godthaab being 29.55, prevailing wind NNE., force 4. The barometric gradient increases rapidly to the east and southeast, and very slowly in a south and southwest direction.

The second area of low barometer extends over Northern Russia, and is central near Archangel, where the mean pressure for the month was 29.54, and the prevailing wind WNW., force 6.

The barometric gradient here increases rapidly to the westward and somewhat slowly to the south and eastward.

A third area of mean low pressure occupies the region of British India, where, in the central provinces, the mean pressure for the month was below 29.77.

Three areas of barometric maxima appear upon the chart, one of which extends over Southeastern Siberia, where the greatest mean pressure was 30.26 at Nertschinsk. The isobar of 30.10 extends over the eastern part of Asia and includes the southernmost islands of Japan, while a second area of high pressure (30.20) covers China proper.

A third area of mean high barometer, enclosed by an isobar of 30.20, appears in Europe, over the provinces of Brandenburg and Posen and extending to Austria. The isobar of 30.10 extends from the Black Sea northwestward to the Baltic and westward to the North Sea and western coasts of Europe.

In North America the high area of the Pacific extends over the north Pacific coast regions, where the pressure ranges from 30.11 to 30.16.

Compared with the preceding month, the barometric pressure has increased over Greenland, where the mean is .13 inch above the mean for February. The area of low baromter, then central east of Iceland, has apparently moved eastward with increasing pressure, and is now central over Northern Russia, where the barometer is .21 inch below the mean for the previous month. The pressure has also decreased southward and eastward of this area, the means being about .25 inch below those for February.

In Eastern Asia the mean pressure has averaged about .3 inch below the mean for February.

In the United States the pressure has decreased in all parts of the country, except in the lake region, where it has increased about .1 inch. The isobar of 30.20 which extended over the States of Georgia, Alabama, Tennessee, and parts of North Carolina, and Florida, is this month replaced by the isobar of 30.10.

Compared with the corresponding month of previous years, the pressure was slightly above the normal, north of latitude 35° and from the one hundredth meridian eastward to the Atlantic. In the South Atlantic and Gulf States a slight deficiency occurred, and on the Pacific coast the pressure was about .03 inch above the normal.

The following table exhibits the mean pressure and the mean temperature for the month of March, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during March, in the years 1877, 1878, and 1879:

Countries.	Mean barometer.		Mean temperature.	
	March, 1877-'78-'79.	March, 1880.	March, 1877-'78-'79.	March, 1880.
Algeria	30.06	30.11	61.8	64.1
Austria	29.88	30.15	43.0	43.9
British Isles	29.98	30.05	44.3	48.2
Denmark	29.78	30.13	36.5	40.4
France	29.98	30.10	50.5	58.8
Germany	29.90	30.16	39.9	44.2
India	29.76	29.81	84.9	85.6
Italy	29.92	30.18	54.4	55.1
Norway	29.70	30.02	34.3	39.7
Portugal	30.07	30.07	58.6	60.3
Russia	29.83	29.93	34.2	29.7
Spain	30.05	30.08	57.6	61.8
Sweden	29.73	29.96	29.1	33.2
Turkey	29.92	30.09	54.2	50.9

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of March, 1880, as compared with the means of three years:

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean temperature.			Mean barometer.		
	March, 1877-'78-'79.	March, 1880.	Departure.	March, 1877-'78-'79.	March, 1880.	Departure.
	°	°	°			
York Factory	—11.1	—18.8	— 7.7	29.99	30.01	+0.02
Godthaab	20.1	16.9	— 3.2	29.72	29.95	—0.17
Stykkisholm	29.9	38.1	+ 9.2	29.65	29.69	+0.04
Tromso	28.4	28.0	— 0.4	29.54	29.78	+0.24
Thorshavn	37.7	43.9	+ 6.2	29.75	29.95	+0.20
Archangel	23.3	18.1	— 5.2	29.70	29.54	—0.16
Ekaterinburg	28.0	18.5	— 9.5	29.97	29.55	—0.42
Barnaul	23.2	24.3	+ 1.1	30.27	30.04	—0.23
Yeniseisk	22.8	23.7	+ 0.9	30.17	30.00	—0.17
Nikolaievsk on the Amoor	8.1	9.3	+ 1.2	....	....	....
Zi-Ka-Wei	44.6	44.6	Normal	30.23	30.22	—0.01
Pekin	42.9	44.1	+ 1.2	30.17	30.19	+0.02
Beirut	64.8	59.7	— 5.1	29.98	29.97	—0.01
Mauritius	81.5	80.6	— 0.9	29.95	29.96	+0.01
Fort Napier	78.5	78.2	— 0.3	29.92	29.83	—0.09
Paramaribo	80.9	78.9	— 2.0	30.03	30.00	—0.03
Funchal	63.8	64.0	+ 0.2	30.15	30.13	+0.02
Penta Delgado	60.7	60.3	— 0.4	30.25	30.10	—0.15
Bridgetown	81.5	75.6	— 5.9	29.99	30.00	+0.01
Navassa	78.4	76.4	— 2.0	30.01	30.06	+0.05
Melbourne	61.9	63.9	+ 2.0	30.09	29.98	—0.11
Hobart Town	65.1	62.1	— 3.9	29.95	29.71	—0.24
Astrakhan	44.5	29.8	—14.7	29.93	29.99	+0.06
Athens	59.2	53.2	— 6.0	29.94	30.10	+0.16
Tiflis	57.4	43.9	—13.5	29.93	30.02	+0.09
Laghouat	62.1	64.9	+ 2.8	30.09	30.12	+0.03
Fort-de-France	77.4	75.0	— 2.4	29.90	30.20	+0.30
Lisbon	57.9	60.3	+ 2.4	30.08	30.10	+0.02
Sandwick Mause	39.5	42.9	+ 3.4	29.78	30.00	+0.22
Malta	60.8	59.4	— 1.4	29.97	29.98	+0.01
Gibraltar	61.2	62.4	+ 1.2	30.04	30.04	Normal
Tashkend	56.5	50.0	— 6.5	30.20	30.05	—0.15
Cape Town	77.0	76.7	— 0.3	29.99	30.01	+0.02
Angra	58.2	58.3	+ 0.1	30.24	30.09	—0.15
Cagliari	57.9	60.1	+ 2.2	29.92	30.05	+0.13
Free Town	87.6	87.3	— 0.3	29.91	29.87	—0.04
Madrid	56.5	59.9	+ 3.4	30.02	30.06	+0.04
Nukuss	56.5	45.7	—10.8	29.99	30.03	+0.04
Nassau	73.0	71.7	— 1.3	30.09	30.12	+0.03
Havana	72.6	74.2	+ 1.6	30.06	30.06	Normal
Mexico	49.2	51.3	+ 2.1	30.21	30.12	—0.09
Lahore	76.7	86.7	+10.0	29.85	29.78	—0.07
Tokei	42.5	45.1	+ 2.6	29.99	30.02	+0.03
San Juan de Puerto Rico	77.4	75.7	— 1.7	30.04	30.11	+0.07

In North America the temperature has been above the normal from the interior of the continent, eastward to the Atlantic, except in the New England States and Canadian maritime provinces, where it has been below the normal. At the Rocky Mountain stations and on the Pacific slope it was below the normal. The greatest excess of temperature prevailed in Florida and the greatest deficiency was reported from the Canadian maritime provinces.

In Europe, the temperature was above the normal, except in Russia. The following are some of the extreme monthly mean temperatures reported at isolated stations:

Lowest.	Degrees.	Highest.	Degrees.
York Factory	—18.8	Freetown	87.3
Moose Factory	— 4.1	Manila	82.8
Fort Garry	— 1.4	Mauritius	80.6
Nikolaievsk on the Amoor	+ 9.3	Paramaribo	78.9
Nertschinsk	+12.6	Navassa	76.4
Godthaab	16.9		
Archangel	18.1		
Ekaterinburg	18.5		
Barnaul	24.3		

The prevailing direction of the wind over North America was northwesterly throughout the country east of the Rocky Mountains, except in Texas, Florida, and along the South Atlantic coasts, where it was generally southerly; on the North Pacific coast and in the Plateau regions, southeasterly; in California and Mexico, easterly; in Canada and the maritime provinces, northwesterly.

In Europe, the prevailing direction of the wind was easterly to northeasterly, except in Denmark, Sweden, and Norway, and the west coast of Germany, where it was westerly. In Algeria, the winds were northeasterly; in Hindostan, they were generally westerly or northwesterly, and in China and Japan, northerly.

The following notes and extracts, descriptive of the meteorological conditions over Europe, for the month of March, 1880, are taken from the Monatliche Uebersicht der Witterung:

From the 1st to the 8th of the month, two depressions prevailed over Northern Europe, and extended their influence over the greater part of Europe, excepting the southern peninsulas.

During these disturbances, the pressure increased very slowly in the northern quadrants, while in the southern quadrants the increase was very rapid, as shown by the following: On the 3d the pressure at Shields and at Vestervig was 28.82, and on the same day, at Rochefort and Vienna, it was 30.00. During that day stormy WSW. winds prevailed on the coast of Germany, whereas, at Borkum, the wind was light south, with snow and rapidly falling temperature; the same conditions prevailed at Hamburg during the afternoon of the 3d, but toward night the wind again changed to WSW., with greatly increased force, registering at times a velocity of 70 miles per hour.

Equally strong SW. winds occurred at all stations in North Germany, while in the southern sections of the country fresh SW. breezes, with generally clear weather prevailed. At the morning observation of the 2d, Liverpool and Nottingham reported light SW. wind with snow, and temperature lower than at any other stations in England.

On the morning of the 8th there was a decided change in the distribution of pressure, the barometric minima above referred to being replaced by an area of high and increasing pressure, which continued with slight changes till the end of the month.

The precipitation in Europe was generally below the normal for the month. The rainfall accompanying the storm of the first decade appears to have been excessive in the Rhine provinces where several streams overflowed, causing serious floods and delaying railroad travel. The weather during the second period of the month was unusually dry and clear.

Over the North Atlantic, west of the fiftieth meridian, and north and south of latitude 40°, during the first decade of the month, the weather was stormy, with variable winds and heavy rains.

3d. N. 26°, W. 53°, NE., force 9; heavy squalls; in N. 38°, W. 57°, NNW., force 11; hurricane-like squalls, hail, thunder and lightning, high confused sea.

4th. In N. 39°, W. 66°, SSW., force 10.

5th and 6th. In N. 40°, W. 62°, SSW. 10 to NNW., 11; lightning.

8th. In N. 39°, W. 57°, SE; force 11; rainy and lightning.

10th and 11th. In N. 40°, W. 52°, SSE. to NNW.; force 11; rain and lightning, high cross-sea.

Between 50° and 30° west longitude the weather was generally stormy, with high northerly and westerly winds.

East of the thirtieth meridian, southwesterly winds prevailed, and near the coasts of Europe the weather was generally settled.

During the second and last decades of the month the weather over the ocean was generally stormy, with variable winds, mostly northwesterly, rain, snow, and hail.

Chart V exhibits the paths of barometric depressions which have been traced from the daily international charts for the month of June, 1880, supplemented by vessel reports from the North Atlantic.

The data received are charted for each day of the month on the charts accompanying the International Bulletin for that day, and from these charts and additional reports, the movement of the centers of barometric minima are traced.

Nineteen of the principal storm-areas occurring in the northern hemisphere have thus been traced.

Concerning the general distribution of these depressions, the following is given:

Nine passed over parts of the United States and Canada, five of which are traced to the Atlantic, but in two of these only, viz, Nos. II and VI, have sufficient data been received to warrant the tracing of a continuous storm across the ocean. The depressions, with two exceptions, were generally ill-defined, and exhibited but slight energy.

Four depressions are exhibited over Europe, one of which extends from the interior of Spain in a northeasterly direction, through Central Europe and Southern Sweden to the eastern shores of the Gulf of Bothnia. The other, No. XII, extends from Southwestern France, northeastwardly to Austria. The remaining two appear over Northern Europe.

Six depressions are traced in Eastern Asia, extending from the coast of China, generally in a northeasterly course over the island of Niphon.

The following brief descriptions are given of the storms first appearing within the limits of the Signal Service stations:

I.—This depression appeared on the morning of the 3d, near Fort Benton; moving southeastward, the area was central near North Platte on the morning of the 4th. On the 5th, the depression was central near Omaha, the barometer at that station reading 29.11, or .65 inch below the normal. Moving northeastwardly, the storm was central in Northern Michigan on the 6th, Escanaba barometer, 29.18. From this point, the center passed down the Saint Lawrence Valley and into the province of Quebec, with decreasing energy. During the passage of this storm very heavy rains and high winds occurred, causing serious damage to shipping on the lakes.

II.—This was apparently central off the coast of British Columbia on the morning of the 7th; following an east-southeasterly course, the center reached Fort Buford on the 8th; thence, it passed northeastwardly into Manitoba.

III.—This depression first appeared in Colorado on the 8th, where it remained stationary until the 11th. During that day it passed to the northeast, and on the 12th was central near Pembina. On the 13th the center was apparently near Parry Sound, barometer 29.61, and on the 14th it moved eastward over the Atlantic. Owing to lack of data, its subsequent movement cannot be traced. During the passage of this storm a violent tornado occurred in Iowa, causing loss of life and great destruction of property. The storm was accompanied by heavy rain and hail.

IV.—This appeared over Nova Scotia on the 12th, where it remained stationary until the 14th. On the morning of the 15th, the center passed off over the Atlantic to about N. 46°, W. 52°. The following vessel reports probably indicate the further movement of this storm: 16th, steamship Erin in N. 46°, W. 42°, moderate W. gale, head sea; schooner Delia Hodgkins in N. 52° 56′, W. 52° 52′, barometer, 29.69, NNE., force 8; S. S. Circassian in N. 47°, W. 41°, strong W. gale, high head sea; 17th, S. S. Bath City in N. 46°, W. 42°, hard NW. gale, high sea; 18th, S. S. Nederland in N. 44° 39′, W. 32° 33′, W., force 6, high sea; 19th, steamship City of Chester in N. 47°, W. 31°, moderate W. NW. gale; steamship Pennsylvania in 49° 27′, W. 20° 41′, barometer 29.45, SE., force 6, heavy sea; 20th, steamship Braunschweig in N. 49° 01′, W. 17° 49′, 29.46, S., force 2; steamship Celtic in N. 50° 15′, W. 23° 55′, 29.62, NE., force 4. On the 21st, the center of disturbance was probably over Galway Bay, the barometer at Galway reading 29.52, calm; on the same day, the steamship Indiana in N. 51° 11′, W. 16° 17′, reported, barometer, 29.55 SW. During the 22d and 23d, the depression was apparently stationary over the British Isles, where it finally disappeared.

V.—During the 13th, the pressure slowly decreased in Kansas, and by the morning of the 14th, a decided depression had formed. Moving eastward, the center of disturbance reached West Virginia on the morning of the 15th; it then moved southeastward during the day and passed off the North Carolina coast, over the Atlantic. On the 16th, bark John Sheppard in N. 34°, W. 70°, reported fresh SW. gale. This depression occasioned a violent wind and rain storm in Ohio; many buildings, bridges, &c., were destroyed by the heavy floods.

VI.—This storm developed in the Saint Lawrence Valley on the 21st, and moving slowly southeastward through Maine, was central on the 22d near Halifax, N. S. In connection with the passage of this area, NW. winds ranging in velocity from 20 to 40 miles per hour were reported from various stations on the New England coast.

The following vessel-reports probably indicate the eastward movement of this disturbance: 23d, steamship Nederland in N. 40° 33′, W. 58° 42′, barometer 29.51, WSW., force 4; bark A. S. Taylor, in N. 35°, W. 63°, lost sails in a gale; 24th, U. S. steamer Alliance, in N. 45° 35′, W. 53° 55′, 29.59, E. SE., force 2, light rain; steamship Celtic, in N. 42° 36′, W. 53° 05′, 29.54, NW., force 3, heavy rain; 25th, U. S. Steamer Alliance, N. 46° 25′, W. 50° 50′, 29.49, NNE., force 2 to 4; steamship Indiana, in N. 43° 03′, W. 41° 59′, 29.63, WSW., force 8, heavy rain; 26th, steamship Victoria, in N. 45° 12′, W. 37° 28′, strong breeze, head sea; steamship Denmark, N. 45° 22′, W. 39° 04′, strong and increasing SW. wind, high head sea; steamship Vaderland, N. 45° 34′, W. 37° 28′, strong, SSW. to W. breeze, rain and high head sea; 27th, steamship Hibernian, N. 51° 05′, W. 34° 14′, 29.47, WNW. This depression appears to have passed northeastward south of Iceland, and on the 28th was probably central near Thorshavn, the barometer at that station reading 29.50, wind shifting from SE. to W. The disturbance continued its northerly course and on the 29th was central, with increasing pressure near Brono, barometer 29.60, wind W.

VII.—This area developed in Northern Minnesota or Manitoba during the 22d, and on the 23d was central near Duluth; it passed thence over Lake Superior beyond the stations of observation. This storm was of slight energy, no winds of over 25 miles per hour being reported.

VIII.—This appeared in Michigan on the 24th, and moving in an easterly course the center reached the maritime provinces on the 25th. On the 26th it was central near Farther Point, and during the day passed over Cape Breton Island to the Atlantic; the bark Ivigtut in N. 44° 13′, W. 54° 31′, reported barometer, 29.78, SSE., drizzling.

IX.—This depression first appeared in Manitoba on the 26th. Moving slowly in an easterly direction it was central over the lakes on the morning of the 28th, and on the following day reached the province of Ontario; pursuing a northeasterly course it passed down the Saint Lawrence Valley and beyond the stations of observation.

In connection with the storms occurring over Europe, some interesting notes have been taken from the Monatliche Uebersicht der Witterung, published by Prof. Dr. Géo. Neumayer, of Hamburg.

X.—The barometer was low in Spain at the beginning of the month, and on the 2d the depression had extended to France, and was central near Bourges. Moving in a northeasterly course, the center of disturbance reached Berlin on the 3d and on the 4th passed over the Baltic to Sweden. During the 4th and 5th the center passed near Upsala; its course then apparently changed to the eastward and passed over the Gulf of Bothnia. On the 6th it was central near Dorpat; its further movement was not sufficiently defined to admit of its being charted.

XI.—This depression apparently developed north of Scotland on the 6th, barometer at North Unst, Shetland Isles, reading 29.49, a fall of .30 inch in twenty-four hours. During that day it moved in a northeasterly course towards the Norwegian coast, and on the 7th was central near Bergen. Its course then changed to the north-northeastward, with increasing pressure during the 8th, 9th, and 10th, and on the latter date it disappeared over the Arctic Ocean.

XII.—This first appeared in Southwestern France on the 10th, and following a course slightly north of east, it reached the southwestern frontier of Germany on the 12th; it then passed southeastward towards the Black Sea, where it disappeared. In connection with this storm, a second depression probably formed, which extended its influence over Central Europe, causing unusually heavy rains and thunder-storms.

The following will be found interesting: On the 12th, a severe thunder-storm, accompanied by heavy rain, burst over the vicinity of Hamburg; trees were uprooted and chimneys blown down. The lightning was unusually severe. In the kingdoms of Prussia and Saxony, as also in Hanover and Westphalia, the storm was equally severe, especially in the latter provinces, where several rivers overflowed, causing disastrous floods; much damage resulted from hail. At Lippstadt, in Westphalia, 137.8 mm. or 5.425 inches of rain fell in seventeen hours; several washouts occurred on the railroads and bridges were swept away. It may be noted as interesting, that the rainfall at Lippstadt, for the first half of the month under consideration, amounted to 206.2 mm. or 8.123 inches, while the total rainfall for the month of May was only 14.2 mm. or 0.55 inch.

The greatest damage to property and loss of life appear to have occurred in Saxony at and in the vicinity of Zittau.

Four hundred and twenty-three dwelling-houses were almost totally wrecked, while a greater number of other buildings were more or less damaged. Reports place the damage to property at $154,500.

At Oberlausitz, sixty persons lost their lives; a large number of dwellings and other buildings were demolished or damaged. It is impossible to estimate the damage to property.

XIII.—This probably developed in the Arctic, and on the 17th appeared near Archangel, barometer 29.63, a fall of .50 inch during twenty-four hours. Moving in a southeasterly direction, the center of disturbance reached Kasan on the 18th, barometer 29.32, a fall of .62 inch. The course apparently changed to the eastward and, on the 19th, the depression was central near Ekaterinburg, barometer 28.94; on the 20th it probably disappeared in the valley of the Obi.

The following general description of the depressions traced along the coast of China and Japan are given, together with extracts from the Bulletin Mensuel, published by M. Marc Dechevrens of the Zi-Ka-Wei Observatory:

During the month of June, 1880, incessant rains prevailed over the interior of China; the abundant rainfall of the preceding month gave rise to grave apprehensions concerning the harvest, and during the month under consideration these fears were realized. In addition to blighted harvests, the province of Canton has suffered severely from disastrous floods; in some instances entire villages with their total population were swept away.

The following comparison of rainfall at Hong-Kong is interesting as showing the unusual amount of precipitation during this month:

In 1877, the June rainfall was 9.37 inches; in 1878, 15.36; in 1879, 11.32, while during the same month in 1880 it reached the exceedingly large amount of 28.06 inches. As a striking contrast to the above, the monthly rainfall at Zi-Ka-Wei and northern stations was below the average, and near the fortieth parallel almost absolute drought prevailed.

In Japan the rainfall was about the average.

The depressions occurring over China and Japan during the month were only of slight energy.

XIV.—This apparently developed near Zi-Ka-Wei on the 5th, and on the 6th was probably central near Nagasaki, the barometer at that station showing a fall of .50 inch. On the 7th the area passed northeastward along the coast of Niphon, and disappeared near latitude 40°. The influence of this depression was probably felt by the ship Sumatra on June 7, in N. 33° 50′, E. 137° 36′, heavy SE. to S. gale.

XV.—This depression appeared on the coast of China, near the twenty-eighth parallel, and on the 9th was probably central over the Eastern Sea, the steamship City of Pekin N. 25° 19′, E. 121° 02′, reporting barometer 29.76 NE., force 6, rainy. On the 10th the area disappeared near N. 30°, E. 130°.

XVI.—Probably developed on the 14th near N. 29°, E. 116°, and moved in a northeasterly course towards the straits of Corea, where it was central on the 15th. It continued its northeasterly course and finally disappeared on the 16th.

XVII.—This depression appeared northwest of Pekin on the 16th, the barometer at that station reading 29.58. On the 17th the center of disturbance was near the Gulf of Pe-Chi-Li; on the 18th it passed over Corea and the island of Niphon, and disappeared to the northeast on the 19th.

XVIII.—This moved to the eastward over China on the 26th and 27th, crossing the Gulf of Pe-Chi-Li on the 28th, when its course apparently changed slightly to the southward. It passed over the southern part of Niphon and disappeared on the 29th. The U. S. Steamer Ashuelot, in N. 33° 29′, E. 135° 58′, reported barometer 29.77, wind ENE.

XIX.—This appeared on the 29th and moving eastward was probably central near Zi-Ka-Wei on the 30th, barometer 29.55 ESE., raining.

Ocean ice.—April 23 to 27: Ship Glory of the Seas, between N. 43° 48′ to N. 43° 00′, W. 52° 22′ passed icebergs and broken ice. 25th, steamship Daniel Steinmann, in N. 45° 47′, W. 43° 42′, passed a large iceberg; on the following day passed sixteen large bergs and field-ice one mile long. 27th: Bark Pillau, in N. 43°, W. 44°, passed several large icebergs and quantities of field-ice. 28th: Steamship Polynesian, in N. 42° 56′, W. 50° 58′, passed several icebergs and on the following day a quantity of field-ice. 29th: Steamship Pensher, in N. 46° 00′, W. 46° 30′, passed iceberg and field-ice; bark Alaska passed quantities of field-ice and one iceberg on southern edge of the banks. 30th: Steamship Katie, in N. 45° 09′, W. 46° 52′, passed one iceberg 80 feet high, and several smaller, and on the same day in N. 44° 25′, W. 48° 30′ met large fields of ice very closely packed and stretching a distance of 35 miles NE. to SW. May 1: Steamship Adriatic, in N. 44° 12′, W. 45° 36′, passed a large iceberg. Steamship Jason, in N. 47°, W. 46°, met ice and remained in it for three days; passed numerous very large icebergs. 3d: Steamship Egyptian Monarch, in N. 42° 52′, W. 48° 46′, passed three large icebergs; Steamship Otranto, in N. 42° 24′, W. 48° 50′, passed several icebergs; Steamship Elysia, in N. 42° 23′, W. 51° 03′, passed three small icebergs, also loose ice. 4th: Steamship Dominion, in N. 44°, W. 45°, passed a large iceberg. 7th: Steamship Erin, in N. 42° 42′, W. 49° 40′ to 50° 30′, passed six icebergs; steamship Abyssinia, in N. 42° 33′, W. 49° 51′, passed thirteen icebergs; ice was first seen in N. 42° 43′, W. 49° 51′, and last seen in N. 42° 43′, W. 50° 42′; ship Magdalen, in N. 45° 03′, W. 45° 40′, passed fleet of large icebergs, some of very great size. 8th: Steamship Amsterdam, in N. 43° 50′, W. 44° 30′, passed two icebergs. 9th: Steamship Amsterdam in N. 42° 25′, W. 50° 10′, passed several small icebergs; steamship City of Brussels, sighted icebergs to the NW., in N. 42°, W. 50°; steamship France, in N. 42° 30′, W. 51° 05′, passed thirteen icebergs; steamship Polino, forced through field-ice 6 miles broad, extending from Newfoundland to Cape Breton. Steamers report that the Cape Breton coast is blocked by ice. 10th: Telegrams from Saint John's state that there are forty-three sailing vessels and eight steamers caught in the ice in the Gulf of Saint Lawrence: steamship Polaria, in N. 42° 59′, W. 46° 55′, passed a quantity of ice; ship Magdalene, in N. 43° 09′, W. 47° 30′, passed three large icebergs. 12th: Steamship Pieter de Conink, in N. 44° 40′, W. 44° 20′ to N. 42° 35′, W. 48° 00′, passed numerous large icebergs. 13th: Steamship Scythia, in N. 42° 58′, W. 48° 22′, passed three icebergs; steamship Bavarian, in N. 42° 50′, W. 50° 00′, passed eight icebergs, all of extraordinary height and length; steamship Canada, between N. 44° 57′, W. 49° 48′, and N. 42° 20′, W. 51° 05′, passed several icebergs. 14th: Steamship Castor, in N. 42° 03′, W. 50° 08′, passed numerous icebergs. 16th: Steamship Donau, in N. 41° 41′, W. 49° 04′, passed an iceberg. 17th: Steamship Barcelona, in N. 46° 26′, W. 43° 30′, passed numerous icebergs. 18th:

Steamship Albingia in N. 41° 37′, W. 48° 37′, passed an iceberg; steamship City of Lincoln, in N. 44° 10′, W. 48° 30′, entirely surrounded by icebergs. 19th: Steamship Bolivia, in N. 45° 35′, W. 44° 14′, passed several large and small icebergs. 19th: The steamship Peruvian, with one thousand passengers on board, is reported as being disabled and locked in the ice at the entrance of the Gulf of Saint Lawrence; she lies in a dangerous position and grave fears are entertained for her safety. Several vessels have been sent to her assistance. 20th: Steamship Bolivia, in N. 43° 12′, W. 47° 46′, passed several icebergs; steamship Herder, in N. 41° 40′, W. 54° 23′, passed icebergs; steamship Strassburg, between N. 42° 31′, W. 48° 24′, and N. 42° 07′, W. 48° 51′, passed several large icebergs; steamship Scotland, at Montreal, 20th, reported having been hemmed in by ice in the Gulf for nine days, and only succeeded in getting clear by passengers and crew cutting an opening. 21st: Schr. Harry Wetmore (whaler) reported twenty-one ships locked in ice north of Cape Ray, also two ocean steamers between Capes Ray and Anguille; steamship Braunschweig, in N. 43° 45′, W. 44° 45′, passed two large icebergs; same day, in N. 43° 26′, W. 45° 00′, passed two icebergs 80 and 100 feet high; steamship Nemesis, on the edge of the Banks, passed thirty-six large and small icebergs. 22d: Bark Nimbus, in N. 44°, W. 46°, sailed 200 miles through fields of ice, and passed several icebergs; steamship Braunschweig, in N. 41° 32′, W. 43° 34′, passed an iceberg 40 feet high; steamship Palestine, in N. 42° 26′, W. 50° 07′, passed two large icebergs and much field-ice; bark Emile, in N. 43° 42′, W. 48° 36′, passed hundreds of icebergs and large ice-fields extending from ENE. to WSW. 23d: Steamship Nevada, in N. 44°, W. 47° to N. 43°, W. 51°, passed ice; steamship Oder, in N. 42° 20′, W. 49° 09′ to N. 42° 04′, W. 51° 15′, passed four icebergs; steamship Schiedam, in N. 43° 27′, W. 44° 16′, passed several icebergs. 24th: Steamship Egypt, in N. 41° 19′, W. 50° 44′, passed large iceberg 70 feet high; steamship Jan Breydel, from N. 43° 19′, W. 45° 00′ to N. 42° 16′, W. 48° 52′, passed numerous icebergs. 29th: Steamship Gellert, in N. 41° 57′, W. 48° 33′, passed large icebergs; steamship Ohio, in N. 42° 50′, W. 48° 50′ to N. 42° 30′, W. 50° 31′, passed several large and small icebergs. 27th: S. S. Batavia, between N. 42° 01′, W. 49° 15′, and N. 41° 47′, W. 51° 03′, passed several icebergs; S. S. Caledonia, in N. 42° 38′, W. 49° 01′, passed numbers of icebergs; S. S. Habsburg, from N. 42° 32′, W. 48° 51′ to N. 43° 24′, W. 49° 23′, passed twenty-three icebergs. 28th: S. S. Rhynland, in N. 41° 34′, W. 48° 19′, passed large iceberg; S. S. Sidonia, in N. 51° 40′, W. 50° 46′, passed sixty icebergs, ranging from 100 to 150 feet high; S. S. Surrey, in N. 42°, W. 50°, passed several icebergs and a quantity of loose ice. 29th: S. S. Silesia, in N. 40° 03′, W. 45° 37′, passed an iceberg; brig Carita, from Saint Pierre for P. E. I., arrived at Halifax after being eleven days in the ice and found it impossible to reach her destination. 30th: S. S. City of Paris, in N. 41° 50′, W. 48° 14′, passed several icebergs; S. S. Mosel, from N. 42° 40′, W. 49° 09′ to N. 42° 39′, W. 50° 76′, passed several icebergs; S. S. Silesia, in N. 43° 48°, W. 53° 00′, passed twelve large icebergs. 31st: S. S. Britannic, in N. 43° 08′, W. 46° 31′, passed small iceberg; S. S. City of Paris, in N. 41° 37′, W. 50° 25°, passed very large iceberg; S. S. Kansas, from N. 42°, W. 48° to W. 50°, passed several icebergs and some field-ice. Capt. S. E. Wright, of the S. S. Carroll, reports, May 31: "Ice-bound in Halifax harbor since 20th; the ice has come along the Nova Scotia shore and in sight of the harbor; such was never before witnessed by the oldest inhabitants."

TEMPERATURE OF THE AIR.

The distribution of mean temperature over the United States for the month of May, 1882, is exhibited on Chart II by the dotted isothermal lines. The table of mean comparative temperatures in the lower left-hand corner of the chart shows the average temperature for the month in several districts as determined from observations taken at Signal Service stations during the month of May for previous years. The second column shows the mean temperature for the current month; the third column shows the departures of the mean of the current month from the mean of several years.

The temperature has been below the mean in all districts except in the North Pacific Coast region (where it is about the normal), the greatest departures being as follows: 8°.2 in the Upper Mississippi Valley; 7°.4 on summit of Mount Washington; 7°.2 in the Missouri Valley; 6°.6 in the Ohio Valley; 6°.4 in the Lower Lake region; 5°.6 in New England, the Upper Lake Region, and Middle Slope; 5° in the Extreme Northwest and 4°.4 in the Middle Atlantic States.

Deviations from mean temperature.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of Chart II. The following items of importance, in connection with the subject, are reported by voluntary observers: *Connecticut:* Southington, mean temperature, 52°.3, or 5°.97 below the average of the past twelve years and lower than for any May during that period; the highest monthly mean, 62°.6, occurred in 1880.

Indiana: Riley, mean temperature 50°.9, or 6°.5 below the average of the past twenty-one years. Only May of 1867 was colder than that of the present year. Mean temperature of spring is 1° below the average spring mean. *Illinois:* Vevay, mean temperature, 62.°4, or 3° below the average of past seventeen years. Maximum temperature, 85° is 5°.65 below the average maximum temperature, and minimum 35° is 9°.06 below the average minimum temperature of the past seventeen years. *Iowa:* Clinton, mean temperature 53°.5, or 8° below the average. *Kansas:* Lawrence, mean temperature 60°.27, or 6°.28 below the average of fourteen preceding years; maximum temperature for month, 90°; minimum, 36°.5; the highest maximum during the past fourteen years, 95°, occurred in 1874, '75, and '80; lowest minimum, 30°, occurred in 1875. Wellington, mean temperature 58°.2, is 10°.2 below the average of the three preceding years. *Maine:* Gardiner, mean temperature 49°.26, or 4°.30 below the average of the past forty-six years, and is lower than for any May during that period; the next lowest mean, 49°.42, occurred in 1837. *Maryland:* Fallston, mean temperature 55°.39, or 6°.54 below the average of the eleven preceding years. During that period the highest monthly means, 63°.16, 63°.83, and 63°.90, occurred in 1871, '72, and '81, respectively; the lowest monthly mean, 58°.68, occurred in 1877, and is 3°.29 above that of May, 1882. *Missouri:* Saint Louis, Missouri, Weather Service reports: Mean temperature about 60°, which is more than 6° below the average of the past forty-five years. The lowest monthly means since 1837 occurred as follows: 60°.5 in 1838; 61° in 1857, and 60° in 1867. *New Hampshire:* Contoocookville, mean temperature 52°.5, which is the lowest May mean that has occurred during the past eleven years, and is 4° below the average of the same period. *New York:* Palermo, mean temperature 49°.8, or 5°.1 below the average of past twenty-nine years. During that period the highest monthly mean, 60°.7, occurred in 1880; the lowest, 47°.5, occurred in 1867. Waterburg, mean temperature 50°.4, or 5°.4 below the average of past eleven years. During that period the highest monthly means, 62°.6 and 62°, occurred in 1880 and '81, respectively; the lowest, 53°.1 (with the exception of that of present year) occurred in 1873. North Volney, mean temperature 50°.2, or 5°.47 below the average of past fourteen years. During that period the highest mean, 62°.43, occurred in 1880; the lowest, 52°.37 (with the exception of that of the present year) occurred in 1869. Mean temperature of spring, 40°.34, is 1°.66 below the spring average of the past fourteen years. The lowest spring mean, 38°.35, occurred in 1875; the highest spring mean, 47°.48, occurred in 1878. *Pennsylvania:* Wellsborough, month the coldest that has occurred during the past ten years. The mean temperature, 50°.5, is 15°.6 below that of May, 1881. During May, 1881, only one frost occurred, while fourteen occurred during May, 1882. Dyberry, mean temperature, 48°.4 is more than 2° below the mean of the coldest May that has occurred during the past twenty years, and 15° below the mean of May, 1881. *Texas:* Clarksville, mean temperature of the month lower than for any May during the past thirteen years. *Vermont:* Woodstock, mean temperature 50°.25, or 3°.77 below the average mean of May from 1868 to 1882 inclusive. During that period the highest monthly mean, 61°.17, occurred in 1880; lowest, 50°.09, occurred in 1873; maximum temperature, 96°.3, occurred May 26, 1880; minimum, 22°.4, occurred May 7, 1874. *Virginia:* Wytheville, mean temperature, 57°.86, or 3°.9 below the average of past nineteen years. The highest monthly mean, 66°, occurred in 1880; lowest, 50°, occurred in 1866. The highest temperature reached during the month, 83°, has been equaled or exceeded thirteen times during the past nineteen years, while the minimum temperature, 32°, is the lowest, with the exception of two years, for the same period. *West Virginia:* Helvetia, mean temperature, 56°.95, or 1°.54 below the average of the past six years.

Table of comparative maximum temperatures for the month of May.

State or Territory.	Maximum for May, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°			°		*Years.*
Alabama	Mobile	92	Montgomery	98	1875	Mount Vernon Arsenal	102		34
Do			Mobile	98	1878				
Arizona	Yuma	104	Maricopa Wells	106	1876	Camp Verde	111		12
Do	Phœnix	102	Tucson	106	1881	Fort Mojave	110		11
Arkansas	Little Rock	87	Little Rock	91	1880	Washington, near	94		28
Do						Fort Smith	93		21
California	Visalia	101	Los Angeles	97	'79, '80	Fort Miller	113		14
Do			Visalia	97	'78, '79				
Do			Red Bluff	97	1878				
Colorado	West Las Animas	85	Denver	92	1874	Fort Lyon	99	1880	26
Connecticut	New Haven	76	New Haven	89	1880	New Haven	93		28
Do			New London	89	1881				
Dakota	Rapid City	89	Fort Sully	101	1874	Fort Abercrombie	102		19
Do	Yankton	88	Pembina	96	1874	Fort Randall	101		22
Do						Fort Sully	101		16
Delaware	Delaware Breakwater	76	Delaware Breakwater	89	1880	Dover	94	1880	7
Do						Fort Delaware	91		45
District of Columbia	Washington	86	Washington	96	1880	Washington	96		59
Florida	Key West	91	Jacksonville	98	'74, '78	Houston	100	'78, '81	4
Do			Saint Marks	97	1874	Okahumpka	99	1879	4
Do						Fort King	98		10
Georgia	Savannah	91	Augusta	100	1878	Oglethorpe Barracks	97	1878	40
Do			Tybee Island	99	1878	Quitman	97	1876	4
Do						Augusta Arsenal	96		51
Idaho	Lewiston	88	Lewiston	88	1879	Fort Lapwai	101		18
Do			Boisé City	88	1881				
Illinois	Cairo	83	Cairo	92	1874	Chicago	98		38
Do						Mattoon	98	1876	2
Indiana	Indianapolis	80	Indianapolis	89	'74, '81	Logansport	99	1881	2
Do						Vevay	98		13
Indian Territory	Fort Gibson	88	Fort Sill	97	1880	Fort Arbuckle	100		20
Do			Fort Gibson	94	'74, '80	Fort Gibson	99		47
Do						Fort Sill	98	1875	9
Iowa	Des Moines	83	Dubuque	94	1874	Boonsborough	96	1880	4
Do			Des Moines	93	1880	Nora	96	1876	6
Do						Glenwood	96	1880	1
Kansas	Leavenworth	89	Dodge City	98	'79, '80	Fort Hays	100	1879	12
Do			Leavenworth	94	'74, '75	Fort Larned	99		18
Do						Fort Riley	99		28

Table of comparative maximum temperatures for the month of May—Continued.

State or Territory.	Maximum for May, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
				°			°		*Years.*
Kentucky	Louisville	85	Louisville	93	1881	Newport Barracks	90		29
Do						Bowling Green	90	1880	3
Do						Chilesburgh	90		4
Louisiana	Shreveport	93	Shreveport	101	1875	Baton Rouge	99		56
Maine	Portland	72	Portland	94	1880	Brunswick	98		53
Maryland	Baltimore	83	Baltimore	95	1881	Fort Washington	97		38
Do						Newmarket	98	1877	3
Massachusetts	Boston	81	Boston	80	1881	Somerset	97	1880	7
Do						Williamstown	95		60
Michigan	Grand Haven	76	Marquette	95	1874	Detroit	94		38
Do						Ontonagon	94		11
Minnesota	Saint Paul	77	Saint Paul	94	1874	Fort Ripley	101		16
Mississippi	Vicksburgh	90	Vicksburgh	95	'74, '77	Brookhaven	98	1875	5
Missouri	Saint Louis	89	Saint Louis	93	1874	Corning	100	1875	7
Do						Saint Louis	97	1878	40
Montana	Cartersville	91	Fort Keogh	98	1881	Fort Shaw	98		13
Nebraska	North Platte	87	North Platte	94	1880	Fort McPherson	100	1879	12
Do						Fort Calhoun	98		5
Nevada	Winnemucca	86	Winnemucca	86	1881	Camp Halleck	104		11
New Hampshire	Mount Washington	46	Mount Washington	62	'79, '80	Auburn	96	1881	5
Do						Grafton	96	1880	2
New Jersey	Little Egg Harbor	83	Sandy Hook	89	1874	New Lisbon	101	1880	1
Do						New Brunswick	98	1880	5
New Mexico	La Mesilla	95	La Mesilla	101	'79, '81	Fort McRae	109		11
Do						Fort Craig	108		25
New York	Albany	79	New York City	94	1880	West Point	101	1880	55
Do			Oswego	94	1879	Newburgh	98		40
North Carolina	Kittyhawk	87	Wilmington	95	1878	Weldon	100	1880	7
Do						Fort Johnson	92		57
Ohio	Cincinnati	83	Cincinnati	94	'74, '75	Cincinnati	96	'77, '81	42
Do						Marietta	94		53
Oregon	Umatilla	96	Umatilla	92	1878	Fort Dalles	96		15
Pennsylvania	Pittsburgh	82	Philadelphia	96	1880	Philadelphia	98	1880	120
Do			Pittsburgh	95	1881	Milton	100	1881	2
Rhode Island	Newport	75	Newport	85	1881	Fort Adams	91	1880	40
Do						Providence	91		35
South Carolina	Charleston	87	Charleston	94	1878	Charleston	94		105
Do						Aiken	97	1881	6
Tennessee	Memphis	90	Memphis	96	1879	Humboldt	98		4

Do						Ashwood	96	1879		3
Texas	Eagle Pass	105	Eagle Pass	116	1879	Ringgold Barracks	123	1879		32
Do			Uvalde	113	1879	Camp Stockton	111			15
Utah	Salt Lake City	83	Salt Lake City	91	1874	Camp Douglas	91			16
Do						Mount Carmel	96.4	1876		3
Vermont			Burlington	91	1880	Charlotte	96	1878		7
Do						Lunenburgh	88			16
Virginia	Norfolk	89	Norfolk	98	1880	Accotink	97	'80, '81		6
Do						Alexandria	96			12
Do						Fortress Monroe	95	1880		55
Washington Territory	Dayton and Pomeroy	86	Dayton	90	1880	Fort Walla Walla	99			14
West Virginia	Morgantown	79	Morgantown	91	1875	Weston	100	1877		2
Do						Helvetia	90	1877		5
Wisconsin	La Crosse	80	La Crosse	96	1874	Embarras	98			14
Wyoming	Cheyenne and Fort Washakie.	77	Cheyenne	88	1874	Fort Laramie	98			27

Ranges of temperature at Signal Service stations.—Monthly ranges of temperature during the month of May varied from 22° to 68° at stations east of the Rocky Mountains, and from 25° to 65° at stations on the Pacific coast. The smallest ranges are: Key West, 22°; Galveston and San Diego, 25°; Port Eads, La., and Punta Rassa, Fla., 26°; Brownsville, Tex., 28°; San Francisco, 29°; Indianola and New Orleans, 30°; Pike's Peak, Colo., and Portsmouth, N. C., 31°; Fredericksburgh, Tex., and New Shoreham, R. I., 33°; Hatteras, N. C.; Delaware Breakwater, Del., and Pensacola, Fla., 34°; Thatcher's Island, Mass., and Macon, N. C., 35°. The largest are: Deer Lodge, Mont., 69°; Cartersville, Mont., 66°; Campo., Cal., 65; Missoula and Terry's Landing, Mont., and Winnemucca, Nev., 63°; Rapid City, Dak., and Umatilla, Oreg., 62; Red Bluff, Cal., and New Chicago, Mont., 59°; Grierson Springs, Tex., and Visalia, Cal., 58°; El Paso, Tex., Fort Buford, Dak., and San Carlos, Ariz., 57°; Dayton, Wash., Eagle Rock, Idaho, and Fort Stevenson, Dak., 56°; Saint Vincent, Minn., Fort Keogh, Mont., Cœuer d'Alene, Idaho, La Mesilla, N. Mex., and Sacramento, Cal., 55°. The greatest *daily* ranges varied in different districts, as follows: New England, from 18° at New Shoreham on the 9th, and 20° at Mount Washington on the 2d, to 32° at Boston on the 8th, and 34° at Springfield on the 4th; Middle Atlantic States, from 21° at Cape May on the 3d and 19th, and 23° at Delaware Breakwater on 9th to 34° at Atlantic City on the 9th, and 45° at Norfolk on the 20th, and Williamsport, Pa., on the 3d and 30th; South Atlantic States, from 20° at Jacksonville, on the 2d and 21, to 27° at Charlotte on the 19th, and 28° at Wilmington on the 4th; Florida Peninsula, from 14° at Key West on the 1st, to 25° at Cedar Keys on the 18th; East Gulf States, from 18° at New Orleans on the 24th, to 30° at Mobile and 31° at Montgomery on the 4th; West Gulf States, from 18° at Port Eads on the 3d, and 19° at Galveston on the 8th, to 33° at San Antonio on the 10th, and 36° at Fort Gibson, on the 1st; Rio Grande Valley, from 23° at Brownsville on the 12th to 44° at Eagle Pass on the 10th and 47° at Uvalde on the 12th; Ohio Valley and Tennessee, from 26° at Indianapolis on the 7th and 17th, and at Columbus on the 17th to 37° at Morgantown on the 3d; Lower Lake region, from 22° at Erie on the 3d and 31st, to 30° at Cleveland on the 3d; Upper Lake region, from 24° at Milwaukee on the 25th, to 35° at Alpena on the 3d, and 36° at Duluth on the 29th; extreme northwest from 34° at Saint Vincent on 14th and 28th, to 41° at Bismarck on the 2d; Upper Mississippi Valley, from 23° at Cairo on the 25th, and 24° at Springfield, Ill., on 26th, to 32° at Saint Paul on 15th and 16th, and at Des Moines on 2d and 16th; Missouri Valley, from 26° at Springfield, Mo., on the 17th, and at Leavenworth on the 15th, 16th, 17th, and 22d, to 41° at Fort Bennett, Dak., on the 3d; Northern Slope, from 31° at Helena, Mont., on the 1st, 11th, and 24th, and at North Platte, Nebr., on the 1st, to 62° at Rapid City, Dak., and 63° at Terry's Landing, Mont., on 2d; Middle Slope, from 18° at Pike's Peak on the 16th, to 36° at Fort Elliott, Tex., on the 1st, and 40° at West Las Animas, Colo., on the 3d; Southern Slope, from 31° at Henrietta, Tex., on the 23d, to 43° at Fort McKavett, Tex., on the 11th, and 50° at El Paso, Tex., on the 12th; Southern Plateau, from 36° at Fort Grant, Ariz., on the 4th, to 50° at Tucson, 51° at Fort Apache, Ariz., and 52° at La Mesilla, N. Mex., on the 11th; Middle Plateau, from 33° at Salt Lake City on the 1st, and 34° at Pioche, Nev., on the 22d, to 42° at Winnemucca on the 10th, and 11th; Northern Plateau, 38° at Spokane Falls, on the 24th, and 39° at Boisé City, on the 11th, to 49° at Missoula, Mont., on the 12th; North Pacific coast region, from 33° at Portland on the 23d, to 44° at Roseberg on the 21st; Middle Pacific Coast region, from 20° at San Francisco on the 9th and 20th, to 34° at Red Bluff on the 31st; South Pacific Coast region, from 23° at San Diego on the 10th, to 54° at Campo on the 11th.

Table of maximum and minimum temperatures for May, 1882.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Mobile	92		Calera	97	36
Do	Montgomery		48			
Arizona	Yuma	104				
Do	Phœnix	102				
Do	Fort Apache		32			
Arkansas	Little Rock	87	49	Madison	92	28
Do				Brinkley and Devall's Bluff.	92	
California	Visalia	101		Borden	111	
Do	Campo		30	Cisco and Emigrant Gap.		24

Table of maximum and minimum temperatures for May, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Colorado	West Las Animas	85		Fort Lyon	88	
Do	Denver		34	Fort Lewis		22
Do	Pike's Peak	35	4			
Connecticut	New Haven	76	31	Southington	85	
Dakota	Rapid City	89		Fort Randall	91	
Do	Yankton	88		Fort Yates		18
Do	Fort Buford		22			
Delaware	Del. Breakwater	76	42			
District of Columbia	Washington	86	37			
Florida	Key West	91		Fort Brook Tampa	95	
Do	Pensacola		52	Live Oak		46
Georgia	Savannah	91		Way Cross	98	
Do	Atlanta		45	Madison		31
Idaho	Lewiston	88				
Do	Eagle Rock		24			
Illinois	Cairo	83		Charleston	87	
Do	Champaign		33	Riley		27
Indiana	Indianapolis	80	37	Logansport	90	32
Indian Territory	*Fort Gibson	88	41			
Iowa	Des Moines	83		Guttenburgh and Nora Springs.		24
Do	Dubuque		31			
Kansas	Leavenworth	89		Clay Centre	96	
Do	Dodge City		39	Wellington		34
Kentucky	Louisville	85	44	Bowling Green	84	32
Louisiana	Shreveport	93	49	Cheneyville	108	
Do				Franklin		34
Maine	Portland	72		Fort Preble	77	
Do	Eastport		29	Gardiner		28
Maryland	Baltimore	83	38	Emmittsburg	87	
Do				Woodstock		29
Massachusetts	Boston	81	31	Westborough	83	
Do				Heath		26
Michigan	Grand Haven	76		Hastings	83	20
Do	Escanaba		20			
Minnesota	Saint Paul	77		Minneapolis	79	
Do	Saint Vincent		22			
Mississippi	Vicksburgh	90		Waynesborough	100	41
Do	Starkville		56	Lake		41
Missouri	Saint Louis	89		Jefferson Barracks		34
Do	Springfield		41			
Montana	Cartersville	91				
Do	Deer Lodge		21			
Nebraska	North Platte	87	33	De Soto	89	
Do					92	
Nevada	Winnemucca	86	23	Humboldt		
New Hampshire	Mount Washington	46	4	Contoocookville	80	
Do				Grafton and New Market.		30
New Jersey	Little Egg Harbor	83		Readington	88	
Do	Atlantic City and Cape May.		34	Atco		28
New Mexico	La Mesilla	95		Deming	97	
Do	Santa Fé		32	Fort Union		23
New York	Albany	79		Troy and West Point.	88	
Do	Rochester		29	Johnstown		24
North Carolina	Kittyhawk	87		Wadesboro	94	
Do	Smithville		43	Goldsboro		34
Ohio	Cincinnati	83		North Lewisburgh and New Athens.		30
Do	Cleveland		31			
Oregon	Umatilla	96	34			
Do	Roseburgh		34			
Pennsylvania	Pittsburgh	82		Fallington	83	
Do				Dyberry		20
Do	Erie and Williamsport.		32			
Rhode Island	Newport	75		Fort Adams	70	33
Do	Narragansett Pier		34			
South Carolina	Charleston	87	52	Allendale, Cheraw, Hardwell, and King's Tree.	94	
Do				Florence		32
Tennessee	Memphis	90		Milan and Withe	92	
Do	Knoxville		41	Erin		36

*Observations from 1st to 12th.

Table of maximum and minimum temperatures for May, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Texas	Eagle Pass	105				
Do	Fort Elliott		31			
Utah	Salt Lake City	83	38	Coalville	77	27
Vermont				Woodstock	81	23
Virginia	Norfolk	89		Snowville	88	32
Do	Cape Henry			Accotink	88	
Do	Chincoteague and Lynchburgh.		42	Wytheville		32
Washington Territory	Dayton	86	30			
Do	Pomeroy	86				
Do	Olympia		30			
West Virginia	Morgantown	79	31	Helvitia	84	30
Wisconsin	La Crosse	80		Beloit	81	
Do	Milwaukee		31	Embarras		30
Wyoming	Cheyenne	77	23	Fort Bridger		19
Do	Fort Washakie	77				

Frosts.—In the various districts they were reported on the following dates: *New England:* 1st to 8th, 11th, 15th to 18th, 24th, 26th, 30th. *Middle Atlantic States:* 1st to 8th, 11th, 12th, 16th to 20th, 24th, 26th, 30th. *Tennessee:* 1st, 16th, 17th, 23d. *Ohio Valley:* 1st to 4th, 6th, 15th to 18th, 23d, 24th, 26th, 29th. *Lower Lake region:* 1st, 2d, 3d, 5th to 8th, 10th, 15th to 18th, 23d, 24th, 27th, 28th, 30th. *Upper Lake region:* 1st to 7th, 14th to 18th, 22d to 25th, 27th, 28th, 29th, 31st. *Extreme Northwest:* 1st, 2d, 6th, 11th, 21st, 22d, 23d, 26th, 28th, 29th, 31st. *Upper Mississippi Valley:* 1st, 2d, 11th, 12th, 15th, 16th, 17th, 21st to 25th, 29th. *Missouri Valley:* 1st, 9th, 13th, 16th, 21st, 22d, 23d, 25th. *Northern slope:* 8th to 24th, 31st. *Middle slope:* 1st, 2d, 5th to 10th, 19th, 20th, 22d, 25th, 30th, 31st. *Northern plateau:* 9th, 10th, 13th, 14th, 20th. *Middle plateau:* 5th, 8th, 9th, 10th, 13th to 18th, 20th, 21st. *North Pacific Coast region:* 8th, 9th, 11th, 13th, 15th, 19th, 20th. *Middle Pacific Coast region:* 13th to 16th, 22d, 23d, 24th. *South Pacific Coast region:* 4th, 9th, 12th, 15th, 16th, 17th.

The occurrence of frosts have also been reported by the following stations not situated in the districts named above: Highlands, N. C., 1st, 23d; Lenoir, N. C., 1st; Augusta, Ga., 16th, 17th; Green Springs, Ala., 16th, 17th; Santa Fé, 7th, 9th, 10th, 22d, 28th.

Damaging frosts have been reported in the various States and Territories, as follows: *Illinois:* Rockford, 23d, the frost nipped the fruit buds, but it is thought that the damage will be light. Anna, 16th, injuring early vegetables. Champaign, 16th, injuring fruit and vegetables. Springfield, 22d, the cold northwesterly winds of early morning seriously injured fruit and vegetables. *Iowa:* Nora Springs, 22d and 23d, killing corn, potatoes, and other vegetables, also injuring the foliage of fruit and forest trees. Cresco, 22d, killing vegetation. Dubuque, 22d, considerable damage done by frost; cherries and plums ruined; apples injured; 23d, all advanced garden vegetables seriously injured. Des Moines, 22d, it is reported from surrounding country that the frost of last night has done much damage. At Ames, the frost is reported to have been the heaviest known at this season for many years; corn and potatoes have been seriously injured, and the foliage of many forest trees has been discolored from its effects. At Fort Dodge, the heavy frost is believed to have killed all the fruit; corn and potatoes were killed in the ground. At Marshalltown, small fruits are mostly ruined and other damage is feared. *Kansas:* Atchison, garden vegetables are cut badly, but no further damage has been sustained. Clay Centre, garden vegetables were slightly injured, other crops suffered no injury; Emporia, tender vegetables on the bottom lands suffered some damage. The frost of the 22d is the first that has occurred at so late a date for many years. Holton, 22d, killing potatoes and all tender vegetation. *Minnesota:* Minneapolis, 23d; the frost nipped the fruit buds and early garden truck, but did no further damage. *Missouri:* Kansas City, 22d. reports state that small fruits have suffered greatly, and that in some districts the crop will be a failure. Rich Hill, 22d, some damage was done to vegetation on low bottoms; wheat and fruit were not injured. *Michigan:* Port Huron, 24th, much damage reported to have been done to the fruit crop in this section. *Nevada:* Carson City, 15th, nearly all fruit frozen. *New Jersey:* Atco, 3d, doing much injury. Moorestown, 3d, very severe, killing vegetation. *North Carolina:* Lenoir, 1st, frost injuring cotton. Weldon, 22d, the cold weather has killed cotton; farmers are plowing up the fields and replanting them. *Ohio:* College Hill, 11th, peaches, pears, cherries, and quince destroyed. Toledo, 24th, much injury done in adjacent country by frosts; beans and peas were entirely destroyed and wheat was damaged to some extent. *Tennessee:* Memphis, 17th, strawberry crop injured. Chattanooga, 19th, the effect of the recent cold weather upon cotton has been very injurious. Many farmers have plowed up their fields and replanted them with corn.

Ice.—The formation of ice has been reported in the various States and Territories, as follows: *Connecticut:* Southington, 6th, 7th, 16th. *Dakota:* Alexandria, 21st, 22d. *Idaho:* Eagle Rock, 17th. *Illinois:* Rockford, 15th; Charleston, 2d. *Indiana:* Logansport, 2d; Wabash, 15th, 16th; Fort Wayne, 1st, 23d, 24th. *Iowa:* Davenport, Clinton, Muscatine, and Nora Springs, 2d; Cresco, 22d, 23d; Fort Madison, 23d; Guttenburg, 22d, 30th; Independence, 21st, 22d; Dubuque, 23d. *Michigan:* Detroit and Grand Haven, 2d. *Minnesota:* Saint Paul, 2d, 23d. *Nebraska:* Genoa, 1st, 21st. *Nevada:* Carson City, 5th, 8th, 9th, 10th, 13th, 14th, 15th, 17th, 20th, 21st. *New York:* Friendship, 16th, 18th, 26th. Waterburgh, 3d, 6th, 7th, 16th, 18th, 19th. Albany, 3d. *Ohio:* Bellefontaine, 1st, 2d, 3d. Cleveland, 3d. Jacksonburgh, 3d, 16th. North Lewisburgh, 3d. Westerville, 1st, 3d. Toledo and Cleveland, 3d. *Pennsylvania:* Fallsington, 3d. *Vermont:* Charlotte, 16th. Strafford, 5th, 6th, 7th, 16th. Woodstock, 3d, 6th, 16th, 26th. *Wisconsin:* Embarras, 2d, 15th. La Crosse, 16th, 23d. *Wyoming:* Fort Washakie, 19th.

PRECIPITATION.

The distribution of rainfall over the United States and Canada, as determined from observations taken at over 600 stations, is exhibited on Chart III. The table on the left-hand corner of this chart shows the average monthly rainfall determined from the records of Signal Service stations, in the several districts, and the excess or deficiency as compared with the average of many years. Large excesses occurred in the Middle Atlantic and West Gulf States, in the Ohio Valley, Tennessee, the Lower Lake region, and Rio Grande Valley; the departures ranging from 2.00 inches in the Rio Grande Valley, to 4.57 inches in the Ohio Valley. On the summit of Mount Washington, an excess of 2.77 inches, and on the summit of Pike's Peak, an excess of 9.08 inches occurred. The largest deficiency occurred in the South Atlantic States, where it amounted to 1.28 inches. In the northern plateau district, a deficiency of 1.12 inches, and in the North Pacific Coast region a deficiency of 0.87 inch occurred, and a slight deficiency is reported from the South Pacific Coast region.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rainfalls (as published in the lower left-hand corner of Chart III). The following items of importance in connection with this subject are reported by voluntary observers: *Illinois:* Riley, monthly rainfall 3.59 inches, or 0.27 inch more than the average of the past twenty-one years. The total precipitation for the spring of 1882 is 2.83 inches more than the spring average of the past twenty-one years, and has been exceeded in but two years during that period, viz, in 1861 and 1868. *Indiana:* Vevay, monthly rainfall 8.65, or 5.12 inches more than the average of the past seventeen years. Laconia, monthly rainfall 7.86 inches, which is the largest May rainfall that has occurred since 1868, when 8.08 inches fell. *Kansas:* Wellington, monthly rainfall 7.20, or 2.20 inches more than the average of the past three years. During that period, the largest May rainfall, 9.37 inches, occurred in 1881; the smallest, 1.16 inches, occurred in 1879. Total rainfall for the five months ending May 31 is 13.47; for the same period in 1881, 14.52; in 1880, 6.78, and in 1879, 6.56 inches. Lawrence, monthly rainfall 3.53 inches, or 0.57 inch below the average of the past fourteen years. Total precipitation for the five months ending May 31 is 10.71 inches, which is 1.19 inches below the average of the same period for the past fourteen years. *Maine:* Gardiner, monthly rainfall 4.74 inches, or 0.66 inch more than the average of past forty-six years. *Maryland:* Fallston, monthly rainfall 3.76 inches; or 0.76 inch more than the average of the eleven preceding years. During that period the largest May rainfall, 6.47 inches, occurred in 1873; the smallest, 0.70 inch, occurred in 1875. *Missouri:* Saint Louis, Mo., weather service reports a slight deficiency in the rainfall for the month, as compared with the average of the past forty-five years. *New Hampshire:* Contoocookville, monthly rainfall 4.25 inches, or 1.00 more than the May average of the past eleven years. *New York:* Palermo, monthly rainfall, 2.53 inches, which is about the May average for the past twenty-three years. During that period the largest May rainfall, 6.90 inches, occurred in 1867; the smallest, 0.30 inch, occurred in 1870. Waterburgh, monthly rainfall, 4.70, or 2.42 inches more than the May average of the past ten years. During that period the largest May rainfall, 4.65 inches (with the exception of May, 1882), occurred in 1881; the smallest, 0.52 inch, occurred in 1879. North Volney, monthly rainfall, 3.55, or 1.54 inches more than the May average of the nine preceding years. During that period the largest May rainfall, 3.15 inches (with the exception of current year), occurred in 1878; the smallest, 1.10 inches, occurred in 1876. Total rainfall for spring, 8.47 inches, or 0.97 inch more than the spring average of the past nine years. *Virginia:* Wytheville, monthly rainfall, 4.45 inches, or 1.00 inch more than the May average of past nineteen years. Total precipitation for the five months ending May 31 is 5.00 inches in excess of the average for the same period for the past nineteen years. *West Virginia:* Helvetia, monthly rainfall, 7.15, or 3.18 inches more than the May average of the past six years.

The following table, furnished by Dr. W. W. Hays, of San Luis Obispo, Cal., shows the monthly and annual precipitation at that place during the past twelve years. The station is situated in the county of the same name, about ten miles from the Pacific coast and about two hundred miles southeast of San Francisco.

Rainfall at San Luis Obispo during the past twelve years.

[Measured by Dr. W. W. Hays.]

Year.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Tot'l.
1869-'70			.84	.66	.78	.71	4.85	.74	2.40	.85			11.83
1870-'71			.68	.38	2.90	1.51	4.43		2.79	.28			12.97
1871-'72				2.40	13.93	5.16	3.45	.71	1.37				27.02
1872-'73					6.00	5.00	1.79						12.79
1873-'74					7.96	4.29	4.04	3.23	1.00				20.52
1874-'75			4.28	2.05	.48	12.10	.28	.50					19.69
1875-'76				6.20	2.20	9.87	5.29	5.30	1.26				30.12
1876-'77			1.16			4.83	.42	1.74					8.15
1877-'78				1.42	3.90	7.88	11.91	2.74	2.75				30.60
1878-'79				1.50	2.58	1.78	2.15	1.60	1.80	.25			11.66
1879-'80			.75	1.40	3.03	1.75	7.23	2.36	8.78	.52			25.82
1880-'81				.48	13.35	4.71	1.90	1.40	1.85				23.69
1881-'82		.40	1.65	.25	2.00	.85	3.40	6.75	1.73				17.03

Table of special heavy, largest, and smallest monthly rainfalls.

Station.	Special heavy.			Largest monthly.	Smallest monthly.	
	Date.	Amt.	Duration.	Amount, inches.	Station.	Amt.
ALABAMA.					ARIZONA.	
		Inch.				*Inch.*
Mount Vernon Barracks	8	4.06		8.57	Phoenix	0.00
Do	21	8.01			Yuma	0.00
Calera	8	4.00		7.78	Casa Grande	0.00
State Line	11	3.04		7.18	Maricopa	0.00
					Pantano	0.00
ARKANSAS.					Bensons	0.00
					Wilcox	0.00
Malvern Junction	6 and 7	5.79		17.36	Tucson	0.01
Do	9	8.26			Fort Verde	0.19
Little Rock	7	4.14		15.91	Fort Grant	0.33
Do	9	6.33			Prescott	0.45
Walnut Ridge	8 and 9	8.40		14.30	Camp Thomas	0.47
Mount Ida	8 and 9	3.70	25 hours.	12.45		
Do	10	1.20	10 min.		CALIFORNIA.	
Fort Madison				10.50		
Prescott	9	5.04		9.43	Brighton	0.00
Madison	9	2.70		8.27	Lathrop	0.00
Arkansas City	10	8.10		7.61	Stockton	0.00
Russelville	8 and 9	4.79		7.14	Rocklin	0.00
Fort Smith	7	2.73			Marysville	0.00
					Chico	0.00
COLORADO.					Turlock	0.00
					Dunnigan	0.00
Pike's Peak	7	3.40		12.34	Willows	0.00
Do	8 and 9	8.31			Byron	0.00
					Davis	0.00
FLORIDA.					Napa	0.00
					Woodland	0.00
Key West	26	2.89		7.46	Mojave	0.00
					Newhall	0.00
GEORGIA.					Spadra	0.00
					Colton	0.00
Way Cross	8	2.93			Indio	0.00
					Mammoth Tank	0.00
ILLINOIS.					Antioch	t'çe.
					Brentwood	t'ce.
Springfield	5	8.35		10.59	Alcatraz Island	0.02

Table of special heavy, largest, and smallest monthly rainfalls—Continued.

Station.	Special heavy.			Largest monthly.
	Date.	Amt.	Duration.	Amount, inches.
ILLINOIS—Continued.				
Cairo	9	4.24		10.22
Anna				9.77
Champaign				8.55
INDIANA.				
New Corydon				11.84
Saint Meinrad				9.23
Vevay	27 and 28	3.15	8 hours.	8.65
Laconia				7.86
Lafayette				7.80
Indianapolis				7.65
New Harmony	9	2.74		
Rising Sun	28 and 29	2.25	6 hours.	
IOWA.				
Cedar Rapids	5	3.25		9.18
Des Moines	4 and 5	2.81		8.53
Muscatine				8.36
Keokuk				7.11
Fort Madison	5	3.30		
KANSAS.				
Argyle				11.02
Winfield				9.70
Clay Centre	26 and 27	6.02		9.37
Oxford				8.16
Salt City				8.16
Belle Plain				8.10
Rolling Green				8.01
Wellington				7.20
Caldwell				7.00
Clay Centre	24	1.90	1 hr. 40m.	
KENTUCKY.				
Bowling Green				8.65
Louisville				7.46
Paducah	9	4.30		
LOUISIANA.				
Amiti City				8.11
Cheneyville	7	3.00		7.65
Whiteville	7	2.55		
Monroe	7	3.14		
New Iberia	21	2.82		
MARYLAND.				
Emmittsburgh	28	2.50	2 hrs. 15m.	
MASSACHUSETTS.				
Thatcher's Island				8.72
MICHIGAN.				
Coldwater	27	3.10		8.12
Northport	30 and 31	2.75		7.50
MINNESOTA.				
Duluth	28	2.58		7.14
MISSISSIPPI.				
Hernando	10	4.44		9.60
Vicksburg	7	2.79		8.30
Lake	8	2.50		8.06
Do	22	2.92		
Brookhaven	8	3.00		7.60
Edwards	7	2.75		7.41
Fayette				7.20
Grenada	8	2.70		
Jackson	8	2.50		
Batesville	10	2.53		
Meridian	22	3.20		

Smallest monthly.	
Station.	Amt.
CALIFORNIA—Cont'd	
Poway	0.04
Tehama	0.05
Williams	0.05
Kingsburgh	0.08
Lemoore	0.08
Fresno	0.10
Rio Vista	0.10
San Fernando	0.10
Farmington	0.13
Suisun	0.14
Galt	0.15
Oakland	0.15
Knight's Landing	0.16
Point San José	0.16
Calistoga	0.17
Martinez	0.17
Campo	0.18
San Diego	0.18
Angel Island	0.19
Tehichipa	0.20
San Francisco	0.21
Goshen	0.23
South Valejo	0.25
Ione	0.27
Princeton	0.28
Brighton	0.31
Petaluma	0.31
Merced	0.32
Red Bluff	0.33
Sacramento	0.35
Visalia	0.37
Tracy	0.40
Anaheim	0.40
Niles	0.45
Pleasanton	0.48
Salinas City	0.49
Delano	0.50
Tulare	0.50
Modesto	0.50
COLORADO.	
Hermosa	0.39
Pagosa Springs	0.50
IDAHO.	
Eagle Rock	0.30
MONTANA.	
Fort Benton	0.35
NEVADA.	
Boca	0.00
Carlin	0.00
Elko	0.05
Beowawee	0.07
Tecoma	0.15
Golconda	0.16
Browns	0.20
Wadsworth	0.25
Carson City	0.29
Pioche	0.29
Fort McDermitt	0.34
Palisade	0.35
Otega	0.37
Humboldt	0.40
Hot Springs	0.50
NEW MEXICO.	
Deming	0.00
La Mesilla	0.10
Fort Wingate	0.14
OREGON.	
Umatilla	0.35

Table of special heavy, largest, and smallest monthly rainfalls—Continued.

Station.	Special heavy.			Largest monthly.	Smallest monthly.	
	Date.	Amt.	Duration.	Amount, inches.	Station.	Amt.
MISSOURI.					TEXAS.	
Protem	7	2.68		10.56	El Paso	0.10
Ironton				9.55		
Springfield				8.07	UTAH.	
Centreville				8.06		
Chamois				7.33	Terrace	0.00
Salem				7.04	Kelton	0.09
					Corinne	0.05
NEBRASKA.					Ogden	0.20
					Salt Lake City	0.26
Lincoln	17	2.75		11.33		
Do	19	3.00				
Do	22	3.25				
NEW HAMPSHIRE.						
Auburn				11.50		
Mount Washington				8.91		
NEW JERSEY.						
Paterson	26	4.12		13.56		
Barnegat	12	2.55		7.22		
Sandy Hook	12	3.04		7.21		
NEW YORK.						
Troy				9.65		
Fort Porter				7.14		
Port Jervis				7.00		
OHIO.						
New Athens	31	1.25	2 hours.	10.61		
Columbus				9.59		
Bethel				9.00		
College Hill				8.50		
Cincinnati				8.47		
Westerville				8.43		
North Lewisburgh				7.95		
Bellefontaine				7.87		
Sandusky				7.11		
PENNSYLVANIA.						
Wellsborough				9.12		
Milton				8.05		
TENNESSEE.						
Grand Junction	9 and 10	5.43		12.18		
Milan	9 and 10	6.10		10.87		
Corinth	10	4.15		9.82		
Ashwood				9.80		
Withe	9 and 10	5.05		9.47		
Paris	9 and 10	4.02		9.41		
Memphis	9	3.22		9.14		
Austin				8.40		
Nashville				7.34		
TEXAS.						
New Ulm	7	2.63		12.25		
Do	27	2.63				
Austin	6 and 7	5.82		9.86		
Hempstead	27 and 28	5.00		9.06		
Paris	7	3.55		7.89		
Palestine	7	2.79		7.56		
Fort Elliott				7.48		
Brownsville	19	2.62		7.07		
Dallas	7	2.51				
Belton	6 and 7	5.33				
Sour Lake	7	3.50				
Tyler	7	2.80				
Waco	7	2.50				
Corsicana	7	3.00				
Fort McKavett	20	1.26	2 hours.			
WEST VIRGINIA.						
Wellsburgh				8.05		
Helvetia				7.15		
WISCONSIN.						
Manitowoc				7.99		

The following table shows the maxima and minima of rainy and cloudy days and percentages of relative humidity as reported from the various districts:

Table of rainy and cloudy days and relative humidity for May, 1882.

Districts.	Rainy days.	Cloudy days.	Relative humidity.
			Percentages.
New England	From 12 to 20	From 8 to 16	From 58.8 to 87.0
Middle Atlantic States	From 13 to 23	From 9 to 15	From 62.9 to 81.8
South Atlantic States	From 7 to 17	From 3 to 11	From 64.8 to 80.0
Florida Peninsula	From 10 to 13	From 3 to 6	From 67.3 to 70.5
East Gulf States	From 8 to 12	From 5 to 8	From 64.7 to 73.0
West Gulf States	From 4 to 19	From 3 to 14	From 56.2 to 79.7
Rio Grande Valley	From 8 to 15	From 8 to 15	From 62.5 to 83.2
Ohio Valley and Tennessee	From 16 to 20	From 6 to 14	From 66.0 to 72.4
Lower Lake region	From 14 to 20	From 7 to 16	From 64.7 to 71.7
Upper Lake region	From 8 to 19	From 6 to 18	From 58.2 to 73.3
Extreme Northwest	From 10 to 15	From 6 to 11	From 63.4 to 74.6
Upper Mississippi Valley	From 9 to 20	From 9 to 16	From 52.7 to 72.5
Missouri Valley	From 13 to 19	From 10 to 17	From 67.1 to 73.5
Northern Slope	From 10 to 19	From 4 to 16	From 55.7 to 69.7
Middle Slope	From 10 to 19	From 4 to 10	From 58.9 to 85.6
Southern Slope	From 7 to 11	From 3 to 11	From 55.3 to 68.3
Southern Plateau	From 0 to 9	From 0 to 4	From 29.5 to 36.5
Middle Plateau	From 4 to 6	From 3 to 5	From 30.0 to 37.8
Northern Plateau	From 5 to 15	From 3 to 10	From 30.0 to 65.7
North Pacific Coast region	From 13 to 14	From 12 to 14	From 61.3 to 69.3
Middle Pacific Coast region	From 3 to 4	From 1 to 4	From 41.2 to 72.2
South Pacific Coast region	From 0 to 4	From 1 to 9	From 36.4 to 71.3

Snow.—The dates on which snow fell in the various States and Territories are as follows: *New Hampshire*, at Mount Washington, from 1st to 4th, 11th to 15th, 18th to 21st, 23d to 26th; elsewhere in the State on the 2d, 11th, 12th, 15th, 18th. *Vermont*, 2d, 11th. *Massachusetts*, 2d, 11th, 12th, 13th, 17th, 18th. *Pennsylvania*, at Williamsport on the 6th. *Michigan*, 1st, 2d, 23d. *Illinois*, 6th, 22d, 23d. *Minnesota*, 20th, 21st, 22d. *Dakota*, 20th, 21st, 22d. *Montana*, 8th, 16th, 18th, 19th, 20th, 22d. *Wyoming*, 7th, 8th, 19th, 21st, 22d. *Colorado*, on summit of Pike's Peak, 1st, 2d, 5th to 11th, 17th, 21st, 24th to 31st; elsewhere in State from 8th to 11th. *New Mexico*, 6th, 7th, 8th, 20th, 21st, 26th. *Idaho*, Mission, 19th. *Washington Territory*, 1st, 5th, 11th, 12th. *Nevada*, at Winnemucca on the 4th and Pioche on the 7th.

In connection with the remarkable and very unusual snow-storms of this month, the following interesting items are given: *Pennsylvania:* Pottsville, 6th, heavy snow-storm prevailed; at Trackville, 3 inches of snow fell. *Iowa:* Marshalltown, 23d, about 1 a. m., heavy snow. Washington, 12th, from 4 to 6 inches of snow fell in the early part of the morning. Clinton, 23d, snow fell to a depth of 1 inch. Davenport, 23d, from 2 a. m., until 5.40 a. m., heavy snow-storm; fully 3 inches of snow fell; at daylight 1 inch remained on the ground. No such storm is remembered as ever having occurred here at this season. Reports from Mehaska, Wapello, and Van Buren Counties state that from one-half to 2 inches of snow fell during the storm. Muscatine, 23d. About 2 inches snow fell. *Illinois:* Riley, 23d, 4.30 to 6 p. m., snow-storm prevailed, being the latest date on which snow has fallen during a record of twenty-nine years. *Maine:* Eastport, 15th, snow fell to a depth of 3 inches, and at Dexter, on the same day, 3 inches of snow fell. *Massachusetts:* 19th, in the southern and eastern parts of Berkshire County, snow fell to a depth of 1 inch. *New Jersey:* 11th, in Warren County, several heavy falls of snow have occurred. South Orange, 6th, a few flakes of snow fell. *North Carolina:* Reports from Highlands, 14th, state that the Balsom Mountains, 70 miles northwest of that place, are covered with snow. *Vermont:* Burlington, 1st, heavy snow-storm during the day.

Depth of snow on ground at end of month.—Mount Washington, N. H.: Three inches. Santa Fé: Six inches of snow remain on the mountains north of station.

Hail.—Mount Ida, Ark., 10th, at 6 p. m.: A violent hail-storm visited this place. Trees were prostrated and tender vegetation was torn to shreds. The hailstones were unusually large. Logansport, Ind., 4th: Severest hail-storm that has visited this place for many years, accompanied by high winds, thunder, and lightning. The hailstones measured from three-quarters to more than an inch in length. Considerable damage was done to crops and a large amount of window-glass was broken. Several buildings were blown down and many others unroofed. The storm began at 6.30 p. m., and lasted thirty minutes. Emmittsburg, Md., 28th: Hailstones sufficiently large to break window-glass. Troy, N. Y., 28th: Hail-storm, doing great damage to crops. New Athens, Ohio, 27th: Hail-storm at 2.30 p. m., covering the ground with hailstones, some of which were as large as hulled walnuts. Shreveport, La., 10th: A terrific thunder-storm began at 4 p. m. From 6.10 to 6.15 p. m. hailstones as large as hen's eggs fell. At Baskom station, 20 miles west of this place, the storm was more severe. The cotton crop was slightly injured. The principal damage done at this place was the breaking of glass in all windows of northwestern exposure. Logansport, Ind., 4th: During a severe storm hailstones of immense size fell, destroying all glass exposed. The cost of glass used to replace that broken during the storm is estimated at $2,000. Chattanooga, Tenn., 10th: From 12.17 to 12.30 p. m. hailstones three-eighths of an inch in diameter fell, doing slight injury to small fruits; 15th: from 12.57 to 1.03 p. m. hail-storm from southwest to northeast. Hailstones measuring half an inch in diameter fell, doing considerable injury to fruit and vegetables. Brackettville, Tex., 6th: A terrific hail-storm struck this station at 8 p. m., and was accompanied by high winds and vivid lightning. Saint Louis, Mo., 5th: One of the severest hail-storms that has visited this city for many years occurred between 4.37 and 4.58 p. m. The storm was preceded during the morning and early afternoon by a low barometer; the temperature rose rapidly and the atmosphere was sultry and oppressive. At about 4 p. m., dense masses of cumulo-stratus clouds appeared in the southwest and rapidly covered the sky. As their eastern edge neared the zenith, large round drops of rain began to fall, and vivid flashes of lightning were observed in the southwestern sky. A few minutes later rain descended in sheets, accompanied by loud peals of thunder. Rain continued to fall in torrents until hail began at 4.37 p. m., when it somewhat subsided. At the beginning, the hailstones were about the size of peas, but they soon increased in size until they assumed the proportions of walnuts. From 4.37 to 4.50 p. m., hailstones varying from the size of hazelnuts to walnuts showered down with terrific and destructive violence. From 4.30 to 4.45 p. m., the wind blew from the west at the rate of 42 miles per hour, having suddenly increased to that velocity from 12 miles. From 4.51 to 4.58 p. m. the hailstones were very large, but fell with less force than those that fell previous to that time. During the passage of the storm the barometer suddenly rose 0.10 inch, after which it fell to its former reading. Hailstones as large as hen's eggs fell in various parts of the city, and in some instances were reported to have been as large as a "base-ball." The largest found on the roof of the building in which the office is located weighed three-fourths of an ounce and measured 5 inches in circumference. The largest stones were quite soft and contained but little ice, while those of smaller size were very hard and contained but a small quantity of snow. After the passage of the storm the wind shifted to northwest, the temperature fell decidedly, with a corresponding increase of pressure. The damage done by this storm has not been accurately determined, but is very great. During the storm many accidents occurred by the running away of teams which were tortured by the falling hailstones. Hickman, Ky., 12th: At 2 p. m. a furious hail-storm set in, lasting about five minutes. Shelbyville, Ill., 5th: The severest hail-storm that has occurred for many years visited this place between 4 and 5 p. m. The hailstones were as large as walnuts, breaking many windows and doing great damage to gardens and farms. Litchfield, Ill., 5th: One of the heaviest rain and hail-storms ever experienced in this vicinity occurred during the afternoon. The hailstones were as large as hickory-nuts. The occurrence of hail-storms of less violence have been reported as follows: Newport, R. I., 20th; Portland, Me., 2d; Albany, N. Y., 12th; Lynchburg, Va., 6th; Fort Macon, N. C., 11th; Denison, Tex., 9th; Shreveport, La., 10th; Little Rock, Ark., 8th, 9th; San Antonio, Tex., 5th, 7th; Laredo, Tex., 6th; Rio Grande City, Tex., 15th; Knoxville, Tenn., 12th, 15th, 16th; Logansport, Ind., 4th; Sandusky, 27th; Toledo, Ohio, 6th; Marquette, Mich., 24th; Duluth, Minn., 10th, 25th; Keokuk, Iowa, 5th; Des Moines, Iowa, 3d; Saint Paul, Minn., 8th; Springfield, Ill., 27th; Huron, Dak., 20th; Cheyenne, Wyo., 15th; Rapid City, Dak., 30th; Fort Keogh, Mont., 15th; Fort Custer, Mont., 19th; Fort Washakie, Wyo., 25th; Fort Shaw, Mont., 4th, 18th; Fort Ellis, Mont., 15th, 18th; Helena, Mont., 16th, 27th, 29th; West Las Animas, Colo., 5th, 26th; Grierson Springs, Tex., 17th; Stockton, Tex., 30th; Fort Elliott, Tex., 24th; Tucson, San Carlos, and Fort Grant, Ariz., 8th; Winnemucca, Nev., 24th; Pioche, Nev., 25th; Eagle Rock, Idaho, 28th; Umatilla, Oreg., 18th; Spokane Falls, Wash., 18th; Portland, Oreg., 14th, 18th; Fort Bidwell, Cal., 2d; Fort Lyon, Colo., 30th; Fort Garland, Colo., 7th, 10th, 30th, 31st; Fort Randall, Dak., 3d; Fort Sisseton, Dak., 19th; Fort Snelling, Minnesota, 9th; Fort Union, N. Mex., 6th, 17th, 31st; Camp near Presido, Tex., 2d; Fort Monroe, Va., 10th; Green Springs, Ala., 11th, 18th; Anna, Ill., 8th, 12th, 27th; Elmira, Ill., 5th; Laconia, Ind., 4th, 27th; Logansport, Saint Meinrad, and Wabash, Ind., 4th; Vevay, Ind., 4th, 5th; Cresco and Nora Springs, Iowa, 4th; Muscatine, Iowa, 5th; Holton, Kans., 25th; Clay Centre, Kans., 26th; Wellington, Kans., 27th; Cornish, Me., 2d; Somerset, Mass., 11th, 18th; Westborough, Mass., 18th; Minneapolis, Minn., 8th; Protem, Mo., 5th, 8th; De Soto, Nebr., 26th; Genoa, Nebr., 4th; New Market, N. H., 2d, 18th; Freehold and South Orange, N. J., 6th; Flushing and Troy, N. Y., 28th; Murphy, N. C., 6th, 10th; Weldon, N. C., 10th; New Athens, Ohio, 27th; Albany, Oreg., 12th; Dyberry, Pa., 18th; Meadville, Pa., 1st; Clarksville, Tex., 26th; Wytheville, Va., 5th; Manitowoc, Wis., 8th; Mission, Idaho, 12th.

Sleet.—Sleet was reported as follows: Boston, 8th; Fort Yates, Dak., 20th; Dubuque, Iowa, 5th; Burlington, Iowa, 23d; Cheyenne, Wyo., 21st; North Platte, Nebr., 22d; Fort Washakie, Wyo., 9th; Pike's Peak, Colo., 1st, 2d, 5th, 6th, 25th; Santa Fé, N. Mex., 9th; Fort Garland, Colo., 9th; Anna, Ill., 12th; Huron, Dak., 20th.

COTTON REGION REPORTS.

The following table gives the average rainfall, mean of the maximum and mean of the minimum temperatures, in each of cotton districts, as shown on the chart issued with the April Review:

Meteorological record for the Cotton Districts for the month of May, 1882.

Districts.	Average rainfall in inches.	Mean of the maximum.	Mean of the minimum.
New Orleans	5.57	84.4	61.1
Savannah	2.59	84.8	60.7
Charleston	2.53	81.9	58.1
Atlanta	2.39	78.9	56.2
Wilmington	2.52	79.0	54.6
Memphis	7.58	77.7	56.3
Galveston	5.25	83.9	59.9
Vicksburgh	7.03	81.9	60.8
Montgomery	3.02	81.9	58.2
Augusta	2.11	82.2	57.8
Little Rock	11.04	78.7	53.6
Mobile	4.69	83.4	58.3

WINDS.

The prevailing direction of the winds during the month of May at Signal Service stations are shown on Chart II, by arrows flying with the wind. On the New England coast they were mostly from the south and southwest; in the Middle Atlantic States from the northeast, south, and southwest; in the South Atlantic States, from the south and southwest; in Florida, from the east; in the Gulf States, Rio Grande Valley, and Southern Slope, from the south and southeast; in Tennessee and the Ohio Valley, mostly from the south; in the Lower Lake region, from the northeast and east, except at Oswego and Rochester, where they were westerly; in the Upper Lake region, mostly from the north; in southern California they were westerly; in the North and Middle Pacific Coast regions from the north and northwest; elsewhere they were variable.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 27,241 miles; Pike's Peak, Colo., 14,716; Delaware Breakwater, Del., 12,967; New Shoreham, R. I., 12,382; Portsmouth, N. C., 12,313; Hatteras, N. C., 11,972; Indianola, Tex., 11,495; Kittyhawk, N. C., 11,354; Dodge City, Kans., 11,276; Thatcher's Island, Mass., 10,870; Sandusky, 10,631; Cape Henry, Va., 10,298; Galveston, 10,216; Sandy Hook, N. J., 10,214; Milwaukee, 10,211; West Las Animas, Colo., 9,983; Barnegat, N. J., 9,878; Macon, N. C., 9,783; Cape May, N. J., 9,771; Champaign, Ill., 9,610; Fort Elliott, Tex., 9,411; North Platte, Nebr., 9,393; Concho, Tex., 9,364; Atlantic City, N. J., 9,303; Fort Keogh, Mont., 9,211; Moorhead, Minn., 9,182; Stockton, Tex., 9,125; Huron, Dak., 8,966; Boston, 8,955; Port Eads, La., 8,739; Bismarck, Dak., 8,707; Omaha, 8,495; Grand Haven, Mich., 8,478; Cheyenne, Wyo., 8,457; Madison, Wis., 8,346; San Francisco, 8,300; Yankton, Dak., 8,294; Coleman City, Tex., 8,230; Saint Paul, Minn., 8,221; Fort Bennett, Dak., 8,194; Eagle Rock, Idaho, 8,088; Rochester, 8,043. The *smallest* are: La Mesilla, N. Mex., 2,502; Roseburgh, Oreg., 2,540; Lynchburg, Va., 2,695; Silver City, N. Mex., 2,847; Visalia, Cal., 2,946; Missoula, Mont., 3,101; Vicksburgh, 2,132; Tucson, Ariz., 3,133; Nashville, 3,362; Williamsport, Pa., 3,489.

High winds.—The highest velocity reported during the month (100 miles, NW.), occurred on the summit of Mount Washington, on the 3d. At that station velocities of 50 miles and over occurred each day during the month, except on the following dates; 3d, 4th, 16th, 19th, and 22d. Velocities exceeding 75 miles occurred as follows: 76, NW., 1st; 82, NW., 2d; 94, NW., 4th; 92, NW., 5th; 76, N., 9th; 84, NW., 21st; 76, W., 28th; 85, NW., 30th. Other stations reporting velocities of 50 miles per hour or over are as follows: Delaware Breakwater, Del., 58, E., 11th, and 54, NE., 12th; Fort Benton, Mont., 60, NE., 12th; Pike's Peak, Colo., 55, SW., 19th; Dodge City, Kans., 62, NW., 19th; West Las Animas, Colo., 54, NE., 22d; Palestine, Tex., 60, SW., 5th; Indianola, Tex., 52, N., 31st; Galveston, 60, NW., 31st; Toledo, 52, E., 6th.

Local storms.—Mount Ida, Ark., 8th: About 7.45 p. m., a violent tornado passed in a northeasterly course about 2 miles south of this place, destroying everything in its path. More than one hundred buildings were demolished; two persons were killed and several injured; many horses, mules, cattle, and poultry were killed. The storm was accompanied by hail and rain.

Fort Wayne, Ind., 27th: At 2 p. m., a tornado of tremendous force struck this county at the intersection of Madison, Monroe, Jackson, and Jefferson townships, destroying several dwellings; barns and smaller buildings were also blown down and their timbers strewn for miles along the course of the storm. The width of the storm track was not more than five rods, within which the destruction was very great.

Emmittsburgh, Md., 28th: Severe storm, uprooting trees.

Clarksville, Tex., 30th: Severe storm occurred during the night, beating down fields of corn, wheat, and oats, and breaking large limbs from trees. The storm lasted thirty minutes.

Delaware Breakwater, 11th, 10.30 p. m.: The severest storm ever experienced at this season began and continued during the night. The signal office was filled with water from the sea washing over the breakwater. The American barkentine John Boizly dragged anchor and went ashore near Green Hill light, 4 miles southwest of station, and was strained badly.

New York: The storm of the 11th and 12th is considered to have been the most severe that has been experienced on this coast during the past twenty-nine years. The track of the New Jersey Southern Railroad was washed away near Sandy Hook. The steamship Pliny, bound from Rio de Janeiro to New York, stranded near Long Branch, N. J., at 3 p. m., of the 13th.

Starkville, Miss., 10th: Storm during the night; wind reaching a velocity of 36 miles. One building in course of construction was blown down.

Palestine, Tex., 5th: Severe storm, during which the wind velocity of 60 miles per hour was recorded. No serious damage was done at this place.

Logansport, Ind., 4th: During a violent storm, several buildings at this place suffered injury. The post-office building had its plate-glass window blown out.

Cairo, Ill., 8th: Heavy storm began at 8.05 and continued until 8.30 p. m. Four cars occupied by fourteen section hands, on the track of the narrow-gauge railroad in the northern part of the city, were overturned and blown down an embankment. For five minutes the wind blew at the rate of 48 miles per hour.

Shreveport, 12th; Houses, forests, and plantations were wrecked in this region this morning by a tornado. One man and two children were killed, and many others dangerously wounded. Near Acadia many houses were destroyed and a large number of cattle killed. A new building was blown down upon a number of workmen, none of whom were killed.

Atchison, Kans., 12th: A tornado at Cherokee City, a small watering place south of Marysville, killed two persons and wounded thirteen. Forty houses were demolished.

Petersburg, Va., 11th: A tornado visited the southeastern part of this State, blowing down several residences and barns, and did considerable damage to crops.

Edwards, Miss., 12th: Severe storm visited this place last night; a number of residences were blown down or otherwise injured.

Louisville, 6th: During the storm last evening a steamer was blown from her moorings a distance of about 40 yards up the river, when she swung around and struck a loaded coal-flat, which had to be unloaded to prevent it from sinking.

Keokuk, 6th: Reports from various points throughout the Des Moines Valley and the vicinity of this city show that the storm of last night was unusually severe. Telegraph wires were prostrated and railroad travel delayed. The Chicago, Rock Island and Pacific Railroad is under water 3 miles above Daniels. Several bridges were washed out on the Burlington and Southwestern and other railroad lines.

Hot Springs, Ark., 13th: Reports from Silver Creek, Ark., show that a violent tornado visited that place on the evening of the 8th. Stock, timber, fences, and orchards were destroyed or injured. At Cado Cave, a residence was blown down and three occupants were thrown into a well. At Williams' Creek, buildings were wrecked and several persons injured. At McKinney's plantation about fifty buildings were destroyed. The damage done at this place will amount to $30,000. At South Fork the post-office was lifted and carried away and its contents destroyed. Hundreds of sheep, hogs, horses, and cattle were lost or killed, and $5,000 in silver and currency were scattered to the winds and lost. One hundred familes are rendered homeless and without shelter. The total damage incurred will not fall short of $150,000. The storm appeared suddenly and was of short duration and moved in a southeasterly direction. At McAllister, a mining settlement in the Indian Territory, on the night of the 8th, a most violent tornado occurred, almost destroying the entire place. Fifty-nine houses were totally demolished and twenty-seven damaged to a more or less extent. Twenty-one persons were killed and forty-two wounded. Settlements Nos. 5 and 7 of the Osage Mining Company were the ones visited, the latter receiving only the partial force of the storm. The fall of rain was very great and was accompanied by a large quantity of hailstones, which fell as far north as Fort Gibson. A washout occurred on the Missouri, Kansas and Texas Railroad near Armstrong, causing suspension of travel. At Paris, Tex., the storm was also severe, and great damage was done to property.

Vandalia, Ill., 5th: A heavy rain-storm accompanied by strong wind swept over this region at 6 p. m., causing considerable damage in this city and in the vicinity of the town of Crouch.

Warrenton, Mo., 9th: A tornado struck the Central Wesleyan College building about 12.15 a. m. completely wrecking it. There were seven persons sleeping in the building at the time who escaped unhurt. Parts of the roof were carried for a distance of half a mile, and some of the timbers were driven into the ground to a depth of from two to three feet. The damage is estimated from ten to fifteen thousand dollars. At Mound City, Atchison County, the damage done was very great. Large trees were twisted off and others uprooted.

Jerseyville, Ill., 9th: Severe storm passed over this county, striking this city about 1 a. m. The heavy walls of a business house were blown down, together with a brick smokestack and numerous chimneys. Several outbuildings in vicinity were blown down. Near Newbern 40 miles of fence was destroyed, and in that section the storm was accompanied by hail, which did much damage to wheat.

Bunker Hill, Ill., 9th: The storm of wind and rain of last night was most severe. Large numbers of shade and forest trees were uprooted.

Minneapolis, Minn., 9th: It is reported that a school-house, 5 miles southwest of Lakefield, was struck by a tornado yesterday. The building was lifted and scattered over the prairie. It was occupied by a teacher and eleven pupils, all of whom are more or less injured. The storm appeared in the form of a funnel-shaped cloud, which bounded along the prairie and passed into Herron Lake, sucking up water to a height of 100 feet.

Memphis, 10th: The severe storm which swept over this section yesterday afternoon did considerable damage. To the south and in the vicinity of Moor's Landing trees and fences were blown down.

Fort Benton, Mont., 12th: Severe storm during night, wind attaining a velocity, for a few minutes, of 70 miles per hour. No serious damage resulted.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for May, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 89.5 per cent. The percentages for the four elements are: Weather, 92.9; Direction of the Wind, 88.8; Temperature, 88.2; Barometer, 87.9 per cent. By geographical districts they are: For New England, 84.8; Middle Atlantic States, 87.8; South Atlantic States, 91.2; East Gulf States, 90.1; West Gulf States, 91.3; Lower Lake region, 90.6; Upper Lake region, 88.3; Tennessee and Ohio Valley, 90.7; Upper Mississippi Valley, 90.4; Lower Missouri Valley, 89.8; Northern Pacific Coast region, 77.1; Middle Pacific Coast region, 96.9; Southern Pacific Coast region, 87.5.

There were 69 omissions to predict (21 being due to the absence of reports from the Pacific coast) out of 3,813, or 1.8 per cent. Of the 3,744 predictions that have been made 53, or 1.42 per cent., are considered to have entirely failed; 85, or 2.27 per cent., were one-fourth verified; 292, or 7.80 per cent., were one-half verified; 521, or 13.92 per cent., were three-fourths verified; 2,793, or 74.59 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—Ninety-one cautionary signals were displayed during the month of May, of which 73, or 80.2 per cent., were justified by winds of 25 miles per hour, at or within 100 miles of the station. Thirteen off-shore signals were displayed, of which 6, or 46.2 per cent., were fully justified; 10, or 76.9 per cent., were justified as to direction; and 6, or 46.2 per cent., were justified as to velocity. One hundred and four signals of all kinds were displayed, of which 79, or 76 per cent., were justified. The above does not include signals ordered at 69 display stations where the velocity is estimated only. Seventeen signals were reported late.

NAVIGATION.

Stage of water in rivers.—In the table on the right-hand of Chart III are given the highest and lowest stages of water observed at Signal Service stations during the month of May,

1882. The Mississippi at Vicksburgh continued to fall, but remained above the danger-line throughout the month. At New Orleans the lowest point [two inches below the danger-line] was reached on the 29th. At Memphis on the 22d the water rose to within 9 inches of the danger-line; at Cairo on the 22d to 30 inches, and at Keokuk on the 6th to 22 inches above the danger-line. The highest water in the Ohio occurred from the 13th to the 18th. The Missouri was highest at Leavenworth on the 22d and 31st, and at Omaha on the 20th.

Floods.—The excessive rainfall in the Western Gulf States during the month has caused disastrous floods, entailing loss of life and much damage to property, especially in the State of Arkansas.

At Jacksonport, Ark., the overflow was the most destructive that has visited that section for years. The town was completely submerged, and persons were obliged to take refuge in the upper stories of storehouses. The flood is said to have been the highest since 1876, the whole country for miles around being a sea of water. The damage to the wheat crop is very great.

At Batesville, Ark., May 12th, during a heavy rain-storm, which continued in torrents for twenty-four hours, the rivers and creeks rose to an unusual height. Mills, houses, bridges, and fences were washed away, and not only the crops, but in many cases the soil is gone, leaving only a bare clay surface. The damage to property in the valley of the White River is generally estimated at more than $500,000. At Hot Springs the damage to property amounted to $30,000; all the bridges and foot-paths were destroyed, several buildings were washed to pieces, and the foundations of others were weakened. Stables, small outhouses, sheds, &c., were totally carried away. Railroad communication was entirely suspended, owing to the damage sustained by the tracks and the destruction of bridges.

In Conway County the destruction was very great, many acres of land being submerged and the crops destroyed; the total loss in this county is estimated at $100,000.

At Little Rock, on the 9th, the streets were flooded, those leading in the direction of the river having the plank sidewalks washed away. The railroad tracks suffered injury and trains were delayed.

Reports from southern Illinois, dated May 5th, state that heavy and unprecedented rains have swollen all rivers and creeks, and caused considerable damage to movable property and growing crops in the bottom lands. The Saint Louis and Keokuk Railroad is under water and railroad traffic is suspended. Serious washouts also occurred on the Chicago, Burlington and Quincy Railroad obstructing travel. The observer at Cairo reports that much damage has been done to the crops in that locality by the heavy rains and floods.

In southern Indiana the counties of Jackson, Lawrence, and Martin were inundated and entire crops destroyed. Fifteen miles of track on the Bedford Narrow-gauge Railroad were washed away.

At Owingsville, Ky., May 12th, the heavy rains caused an overflow in Prickly-Ash Creek, sweeping everything before it. All the fencing along the creek was swept away, and much stock was lost; wheat and corn planted in the bottoms suffered considerable damage.

Reports from Memphis, Tenn., May 10, stated that fears are entertained that another overflow may occur. The Wolf River, to the east of Memphis, has overflowed and washed away several hundred yards of the levee at Raleigh, and 600,000 to 1,000,000 feet of logs were carried out of the river. Numerous plantations are already saturated with water from the threatening river.

At Shreveport, La., 17th, the Red River rose rapidly, caused by the swollen condition of its tributaries. Much damage was done to the cotton crop, and many farmers along the river have plowed up the cotton and are planting corn and millet. Reports from Bolivar County, Mississippi, dated May 22, state that 7,000 acres of land are under water in that county.

At Palestine, Tex., on the 7th, heavy rains caused washouts on the railroad; two bridges and trestle-work near Buffalo Creek were destroyed.

At Saint Vincent, Minn., 4th, the lower part of the town was about 20 inches under water. On the 11th the water receded, but on the 15th again rose and reached the habitations, causing several families to vacate their dwellings. The average depth of water throughout the town was from 3 to 4 feet, except in the extreme northern part, which was not overflowed. The rise being gradual, the people were enabled to secure their property and the damage was consequently slight. The overflowed region extended from Breckenridge, Minn., to Morris, Manitoba, about 25 miles north. No damage occurred to crops in the vicinity of Saint Vincent, as the average width of the flood on either side of the river contiguous to the town did not exceed one mile.

Keokuk, Iowa, during the 6th and 7th, the Skunk and Des Moines Rivers rose rapidly, washing out railroad tracks and causing considerable damage.

High tides—New London, Conn., 12th, 26th; Little Egg Harbor, New Jersey, 11th, 12th;

Fort Macon, North Carolina, 15th; Hatteras, N. C., 14th, very high tide, overflowing the greater portion of the island; Portsmouth, N. C., 14th; Cape Lookout, N. C., 13th, cape nearly covered; New River, North Carolina, 13th, highest tide since 1876; Indianola, Tex., 9th; Flushing, N. Y., very high tides on 10th, 11th, 12th; Delaware Breakwater, 13th; New York, 11th, 12th, highest tides ever known, causing great damage at various watering places along the coasts of Long Island and New Jersey.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the right hand of Chart II. In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the same period.

The following table gives the highest and lowest temperature of water at the several stations, with the range of water temperature, mean temperature of the air at the station, and the depth of water at which the observations were taken. It will be seen that the greatest ranges of water temperature occurred at the following stations: Chincoteague, 21°; Galveston, 19°; New Haven, 16°; Alpena and Toledo, 15°.

Temperature of water for May, 1882.

Station.	Temperature at bottom.		Range.	Average depth in feet and inches.		Mean temperature of the air at station.
	Max.	Min.				
	°	°	°	*Ft.*	*In.*	°
Atlantic City	59.3	51.2	8.1	5	7	58.2
Alpena	55.0	40.0	15.0	12	0	44.4
Augusta	79.9	68.0	11.3	6	10	69.7
Baltimore	67.0	55.0	12.0	9	11	59.4
Boston	54.5	45.2	9.3	25	0	49.8
Buffalo	57.0	46.0	11.0	9	11	49.8
Burlington	......	......	......	......	......	......
Cedar Keys	84.0	70.0	14.0	9	2	75.2
Charleston	77.4	67.4	10.0	41	9	71.7
Chincoteague	70.0	49.0	21.0	6	0	56.2
Cleveland	59.1	48.6	10.5	14	0	51.9
Detroit	57.0	45.0	12.0	24	3	53.2
Duluth	45.0	36.0	9.0	14	11	46.1
Delaware Breakwater	63.5	51.0	12.5	8	7	55.0
Eastport	39.7	35.8	3.9	15	8	43.5
Escanaba	52.0	40.0	12.0	15	0	46.6
Galveston	83.0	64.0	19.0	14	8	75.2
Grand Haven	58.5	46.5	12.0	19	0	51.9
Indianola	82.4	71.7	10.7	9	8	75.8
Jacksonville	81.0	73.0	8.0	18	0	74.6
Key West	87.2	77.8	9.4	17	1	80.0
Marquette	46.9	38.9	8.0	10	8	46.0
Milwaukee	51.5	42.6	8.9	8	0	48.7
Mobile	75.5	69.0	6.5	16	0	72.6
New Haven	63.2	47.2	16.0	14	9	51.3
New London	54.0	46.0	8.0	13	2	51.5
Newport	55.1	43.9	11.2	10	9	49.8
New York	59.0	48.5	10.5	22	7	53.5
New Shoreham	53.8	44.8	9.0	9	4	48.9
Norfolk	70.0	60.0	10.0	16	11	63.0
Pensacola	77.7	72.0	5.7	17	9	72.8
Portland, Me	48.5	40.5	8.0	19	1	51.5
Portland, Oreg	58.8	50.0	8.8	76	4	56.8
Port Eads	70.5	67.0	3.5	9	9	74.1
Provincetown	53.5	44.0	9.5	14	0	48.0
Punta Rassa	87.0	76.6	10.4	11	8	76.7
Sandusky	59.7	48.5	11.2	10	0	52.8
Sandy Hook	56.6	47.9	8.7	2	3	54.3
San Francisco	58.6	53.6	5.0	29	4	56.2
Savannah	78.8	69.9	8.9	13	3	72.8
Smithville	75.0	67.0	8.0	10	0	68.0
Thatcher's Island	50.6	40.5	10.1	7	0	47.8
Toledo	65.0	50.0	15.0	12	1	53.4
Wilmington	74.5	65.0	9.5	13	0	68.5

ATMOSPHERIC ELECTRITY.

Auroras.—No remarkable auroral displays were observed during the month. The most important display occurred on the 17th, and was reported by stations in New England, Alpena, Mich., and Bismarck, Dak., as follows: Portland, Me.: A faint auroral light visible from 9 to 11 p. m. Gardiner, Me.: Faint aurora visible from 10 p. m. to 12.30 a. m. of the 18th; Mount Washington: Faint aurora visible from 10.15 p. m. until 12.20 a. m. of the 18th, extending from northwest to northeast, and to an altitude of 15°; Burlington, Vt.: From 11 to 11.40 p. m., aurora consisting of a dark segment with a few well-defined streamers; Alpena, Mich.: From 8.40 to 11.40 p. m., aurora consisting of a diffuse light in the northern sky, with a few faint streamers shooting towards the zenith; Bismarck, Dak.: Auroral light visible from 9 to 11 p. m.; beams reaching altitude of 15° were observed from 9.30 to 10 p. m. Other displays have been reported as follows: Antrim, N. H., 5th: Aurora observed during the evening. New Corydon, Ind., 9th: Faint aurora observed from 10 p. m. until midnight. Pensacola, Fla., 9th, from 8 to 9.15 p. m.: An aurora of whitish color, sufficiently bright to attract the attention of all persons on the streets, was observed between the north and northwest. The presence of clouds prevented its extent from being more fully determined. Bangor, Me., 10th: Aurora with streamers at 9 p. m.; was more brilliant at 11 p. m. Newport, Vt., 10th: Aurora during the evening. Vevay, Ind., 10th: Faint aurora visible from 10 to 11.30 p. m. Eastport, Me., 11th, from 11 to 11.40 p. m.: Aurora of bright straw color, appearing in bright flashes and fading away at intervals. In the northwest streaks of a deep crimson color were observed. Gardinei, Me., 11th, 8 p. m.: Bright aurora obscured by clouds at 10.30 p. m. Burlington, Vt., 11th: Aurora seen through the openings in the clouds from 9 to 11.40 p. m. Streamers were observed in the northwestern sky at 11.15 p. m. Mobile, Ala., 11th: Faint aurora visible from 8 to 9 p. m. No waves or streamers were observed. It rose to an altitude of about 20° and converged toward the zenith. A short while before 9 p. m. it began to recede and soon disappeared. Alpena, Mich., 13th, from 9 p. m. to 2 a. m. of 14th: Aurora consisting of a diffuse light. Manitowoc, Wis., 13th: Aurora visible during the evening. Alpena, Mich., 14th, 9.30 p. m.: Aurora consisting of a diffuse light with a few streamers. Manitowoc, Wis., 14th: Aurora observed during the evening. Marquette, Mich., 14th, from 10.35 to 11.30 p. m.: Aurora, with beams reaching an altitude of 45°, illuminating the whole northern sky. Burlington, Vt., 19th, from 10 to 11.45 p. m.: Aurora consisting of a dark olive-green light; no prominent features. Bismarck, Dak., 19th, from 8 to 11 p. m.: Faint auroral light. Lansing, Mich., 20th: Aurora during evening. Hastings, Mich., 21st: Aurora during evening. Marquette, Mich., 21st, 9.45 to 11.10 p. m.: Auroral light extending across the northern heavens. Escanaba, Mich., 21st, from 8 to 10.15 p. m.: Diffuse auroral light with a few streamers pointing toward the zenith. New Corydon, Ind., 23d, 2 a. m.: Aurora with white segment; altitude 10°, azimuth 65°. Gardiner, Me., 25th, at midnight: A flattened auroral arch with dark cloud beneath appeared; at 3.20 a. m. the arch was brighter and extended farther eastward. New Haven, Conn., 26th: Dim auroral light discernible in the northern sky at 1 a. m. Cambridge, Mass., 26th: Auroral light observed at 10.15 p. m. Gardiner, Me., 26th: Faint auroral light from 11 p. m. to 12.30 a. m. of the 27th.

Thunder-storms.—Thunder-storms were reported in the various districts on the following dates: *New England*, 7th, 14th, 16th, 24th, 28th, 29th, 30th. *Middle Atlantic States*, 1st, 5th, 6th, 9th, 10th, 11th, 13th, 14th, 17th, 20th, 21st, 22d, 23d, 24th, 26th, 27th, 28th, 29th, 31st. *South Atlantic States*, 4th to 7th, 9th to 12th, 14th to 17th, 25th, 26th, 28th, 29th, 31st. *Florida Peninsula*, 1st, 2d, 6th, 7th, 8th, 10th, 11th, 15th, 24th, 26th, 27th, 29th. *East Gulf States*, 6th to 11th, 13th, 20th, 21st, 27th, 28th, 29th, 31st. *West Gulf States*, 2d to 10th, 13th, 20th, 25th, 26th, 27th, 30th, 31st. *Ohio Valley and Tennessee*, 4th, 13th, 15th, 16th, 25th to 28th, 31st. *Lower Lake region*, 1st, 4th, 8th, 9th, 10th, 24th, 27th, 28th, 31st. *Upper Lake region*, 3d, 4th, 6th to 10th, 13th, 18th, 24th, 25th, 27th, 30th. *Upper Mississippi Valley*, 3d, 4th, 5th, 7th, 8th, 9th, 10th, 19th, 20th, 24th to 28th, 30th, 31st. *Missouri Valley*, 3d, 4th, 5th, 8th, 16th, 18th, 19th, 23d, 24th, 26th, 29th, 30th, 31st. *Extreme Northwest*, 4th, 16th, 18th, 31st. *Northern Slope*, 2d, 3d, 5th, 7th, 15th, 16th, 19th, 26th to 30th. *Middle Slope*, 1st, 2d, 5th, 6th, 15th to 19th, 24th, 25th, 26th, 29th. *Southern Slope*, 1st to 6th, 8th, 9th, 16th, 17th, 18th, 21st, 23d to 26th, 28th, 29th, 30th. *Rio Grande Valley*, 3d, 5th, 6th, 12th, 16th, 17th, 18th, 20th, 24th, 28th, 31st. *Northern Plateau*, 1st, 2d, 3d, 6th, 10th, 11th, 12th, 16th, 18th, 27th. *Middle Plateau*, 23d, 24th, 25th, 28th. *Southern Plateau*, 6th, 7th, 8th, 13th, 17th, 22d, 29th, 30th.

Thunder-storms were also reported from the following stations not included in the districts named above: Portland, Oreg., 2d; Red Bluff, Cal., 2d; Visalia, Cal., 2d.

During thunder-storms the following instances of damage by lightning have occurred: Clay Centre, Kans., 26th: At Wakefield, 16 miles southeast of this place, a store was struck, cutting the chimney in halves and melting a number of cans containing fruit. Little Rock, Ark., 4th: A house at this place was struck; the lightning knocked down the chimney and tore off a part of the roof about 10 feet square. It passed down a metallic spout and through a barrel full of water, knocked out the bottom of the barrel and entered the ground, making a hole about 2 feet in diameter and 2 feet deep. On the 9th a tree in the State House yard was struck; at the same time a man was made insensible on the street about 200 yards distant. Bismarck, Dak., 31st: Lightning struck and tore out the end of a dwelling. A man, the only occupant of the house, was thrown violently down. Silverware in the house was melted. Huron, Dak., 4th: Lightning struck a wind vane, passing from it to the anemometer, and from thence along the wires to the self-register, burning that instrument, together with telegraph instruments, switch, and ignited the window curtain. Four distinct explosions occurred within the office, and were heard nearly a square distant. The observer felt a severe shock, which rendered him insensible for several minutes. At Shelbyville, Ky., during a thunderstorm on the night of the 4th, the lightning struck several points in the town. Trees, fences, and houses were more or less damaged; the inmates of one of the houses had a very narrow escape, being made insensible by the fluid. Several valuable cattle were killed.

Telegraphic communication interrupted by atmospheric electricity.—Fort McKavett, Texas, 20th, 30th. Fort Elliott, Texas, 1st, 2d, 6th, 29th.

OPTICAL PHENOMENA.

Solar halos.—Solar halos have been observed in the various districts on the following dates: *New England*, 3d, 5th, 6th, 7th, 8th, 9th, 10th, 21st, 22d, 25th, 28th, 30th, 31st. *Middle Atlantic States*, 8th, 9th, 22d, 24th, 26th, 28th. *South Atlantic States*, 8th, 11th, 19th, 20th, 24th, 31st. *Florida Peninsula*, 2d, 23d, 29th, 30th. *West Gulf States*, 17th, 23d. *Ohio Valley and Tennessee*, 3d, 4th, 7th, 8th, 9th, 14th, 15th, 19th, 21st, 24th, 26th, 30th. *Lower Lake region*, 3d, 5th, 6th, 8th, 16th, 17th, 19th, 24th, 26th, 30th. *Upper Lake region*, 2d, 5th, 6th, 7th, 8th, 14th, 19th, 21st, 24th to 29th. *Upper Mississippi Valley*, 3d, 6th, 9th, 14th, 18th, 19th, 24th, 26th, 27th, 29th, 30th. *Missouri Valley*, 20th, 25th, 28th, 30th. *Northern Slope*, 24th, 25th, 31st. *Middle Slope*, 7th, 9th, 10th, 16th, 21st, 28th. *Northern Plateau*, 5th, 11th, 21st, 22d, 24th, 30th, 31st. *North Pacific Coast region*, 21st, 28th, 31st. *Middle Pacific Coast region*, 4th, 5th, 13th, 17th, 18th, 22d, 23d, 27th.

Solar halos were also reported from the following stations not included in the districts named above: Saint Vincent, Minn., 28th; Bismarck, Dak., 28th; Campo, Cal., 1st; Carson City, Nev., 23d; Salt Lake City, 18th, 22d, 23d, 24th, 28th, 31st.

Lunar halos.—Lunar halos have been observed in the various districts on the following dates: *New England*, 23d, 24th, 25th, 26th, 31st. *Middle Atlantic States*, 2d, 3d, 5th, 23d, 24th, 25th, 27th to 31st. *South Atlantic States*, 1st, 4th, 28th, 30th, 31st. *Florida Peninsula*, 23d, 24th, 31st. *East Gulf States*, 4th, 24th, 26th, 27th, 28th, 30th, 31st. *West Gulf States*, 2d, 3d, 24th to 30th. *Ohio Valley and Tennessee*, 1st, 2d, 25th, 27th, 30th. *Lower Lake region*, 5th, 6th, 15th, 24th, 25th, 26th, 30th. *Upper Lake region*, 22d, 25th, 26th, 29th. *Upper Mississippi Valley*, 2d, 22d, 25th, 26th, 27th, 29th. *Missouri Valley*, 3d, 23d, 24th, 26th to 30th. *Northern Slope*, 24th, 25th, 27th, 28th. *Middle Slope*, 5th, 22d, 23d, 30th. *North Pacific Coast region*, 21st, 26th, 28th, 31st. *Middle Pacific Coast region*, 4th, 27th. *South Pacific Coast region*, 1st, 2d, 3d, 25th, 26th.

Lunar halos were also reported from the following stations not included in the districts named above: Stockton, Tex., 22d, 23d, 24th; Fort Yates, Dak., 28th; Uvalde, Tex., 26th.

Mirage.—Indianola, Tex., 1st, 11th, 13th, 22d. Alexandria, Dak., 1st, 3d, 14th, 15th, 24th, 28th, 29th. Northfield, Minn., 28th.

MISCELLANEOUS PHENOMENA.

Sunsets.—The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 189 stations show 5,731 observations to have been made, of which 28 were reported doubtful; of the remainder, 4,902, or 85.9 per cent., were followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, director of the Lawrence Observatory, Amherst, Mass.:

Date—May, 1882.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 4 p. m	2	4	0	0	1	2	3	12	
2, 2 p. m	0	8	0	0	0	5	3	‡20	
3, 2 p. m	0	3	1	3	0	3	3	‡20	
4, 4 p. m	1	3	1	3	1	1	3	18	
9, 2 p. m	3	85	....	....	....	....	5	‡55	
10, 2 p. m	1	5	0	3	1	5	6	‡55	
17, 2 p. m	....	....	....	....	....	....	4	‡90	Many of the spots small.
18, 3 p. m	0	0	0	2	0	0	4	‡90	Many of the spots small.
19, 2 p. m	0	0	1	2	0	0	3	‡90	Many of the spots small.

‡Approximated. Faculæ were seen at the time of every observation.

Date—May, 1882.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
20, 3 p. m.	1	5	0	0	0	0	4	‡90	Many of the spots small.
22, 3 p. m.	0	0	1	‡25	0	0	2	‡35	
23, 2 p. m.	0	0	0	‡15	0	0	2	‡20	
24, 4 p. m.	1	2	1	‡15	1	2	2	10	
25, 2 p. m.	0	0	0	4	0	0	2	6	
26, 2 p. m.	0	0	1	3	0	0	1	3	
27, 2 p. m.	0	0	0	0	0	0	1	3	
29, 6 p. m.	2	3	0	0	2	3	3	5	
30, 2 p. m.	0	0	0	0	0	0	3	4	
31, 3 p. m.	0	2	0	0	0	0	3	6	

‡ Approximated. Faculæ were seen at the time of every observation.

Mr. William Dawson, at Spiceland, Ind., reports: 1st, 3 groups, 22 spots; one large spot on the east edge; 7th, 5 groups, 60 spots, mostly in northeast quadrant; 1 large spot north of center; 10th, 7 groups, 72 spots; condensed group on east edge; 15th, 5 groups, 125 spots; 2 very large groups in the eastern hemisphere; 1 visible to the unassisted eye; 17th, 7 groups, 150 spots; 1 visible to the unassisted eye; 20th, 4 groups, 75 spots; 22d, 2 groups, 12 spots; 24th, 2 groups, 10 spots, 1 spot very close to east edge; 26th, 2 groups, 4 spots, 1 spot very close to west edge and 3 spots near east edge.

Mr. David Trowbridge, at Waterburgh, New York, reports: 2d, 2 groups, 2 spots; 1 large spot just appeared by rotation; 3d, 5 groups, 11 spots; 2 groups appeared by rotation and 1 arisen; faculæ in east; 5th, 4 groups, 6 spots; 6th, 3 groups, 7 spots; 7th, 7 groups, 9 spots; 1 new group appeared by rotation; 8th, 4 groups, 13 spots; 10th, 4 groups, 9 spots; 15th, 4 groups, 17 spots; the large group that disappeared on 26th of April has reappeared, and is visible without the telescope; 16th, 5 groups, 28 spots; 1 new faint group near the center of the disk: 17th, 3 groups, 24 spots; the large group is breaking up into smaller spots, but is still visible without telescope; faculæ generally visible; 10th, 3 groups, 27 spots; 19th, 3 groups, 15 spots; 20th, 3 groups, 18 spots; 23d, 2 groups, 3 spots; the large group visible as 2 large spots; 24th, 1 group, 2 spots; 1 group has disappeared by rotation; 26th, 1 group, 1 spot; the large group has disappeared by rotation, and a new one has appeared by rotation; 20th, 2 groups, 2 spots; 1 new group has appeared by rotation; 30th, 3 groups, 3 spots; 1 faint group has arisen.

Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports: sun spots were observed on all clear days during the month; they were largest and most active from the 8th to the 16th, and smallest at the beginning and close of the month.

The following record of observation has been forwarded by Mr. A. G. Bender, Sacramento, Cal.:

Date—May, 1882.	Number of new—		Disappeared by rotation.		Reappeared by rotation.		Total number of—		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
1, 3.30 p. m.	1	4	......	......	1	1	3	12	
2, 3.30 p. m.	1	5	......	......	......	......	3	12	One group of four spots disappeared.
4, 3.30 p. m.	1	2	......	......	......	......	3	7	Group which app'd 30th ult., disapp'd.
5, 3.30 p. m.	1	3	......	......	......	......	4	10	Perhaps re-app'd.
6, 3.30 p. m.	......	......	......	......	......	......	4	*12	New spots.
8, 3.30 p. m.	1	1	......	......	......	......	5	*12	Changes in spots (size and position.)
10, 3.30 p. m.	......	......	......	......	......	......	4	*10	One group disapp'd.
11, 3.30 p. m.	......	......	......	......	1	*20	5	*30	
12, 3.30 p. m.	1	5	......	......	......	......	6	*35	
14, 4 p. m.	......	......	1	1	......	......	5	*35	
15, 4 p. m.	......	......	1	5	1	*5	4	*35	One group of one spot disappeared. Much change in groups.
16, 4 p. m.	......	......	......	......	......	......	4	*35	Two of these groups may be but one.
21, 4 p. m.	......	......	......	10 or more.	......	......	4	*20	Portion of groups disapp'd by rotation.

* Estimated.

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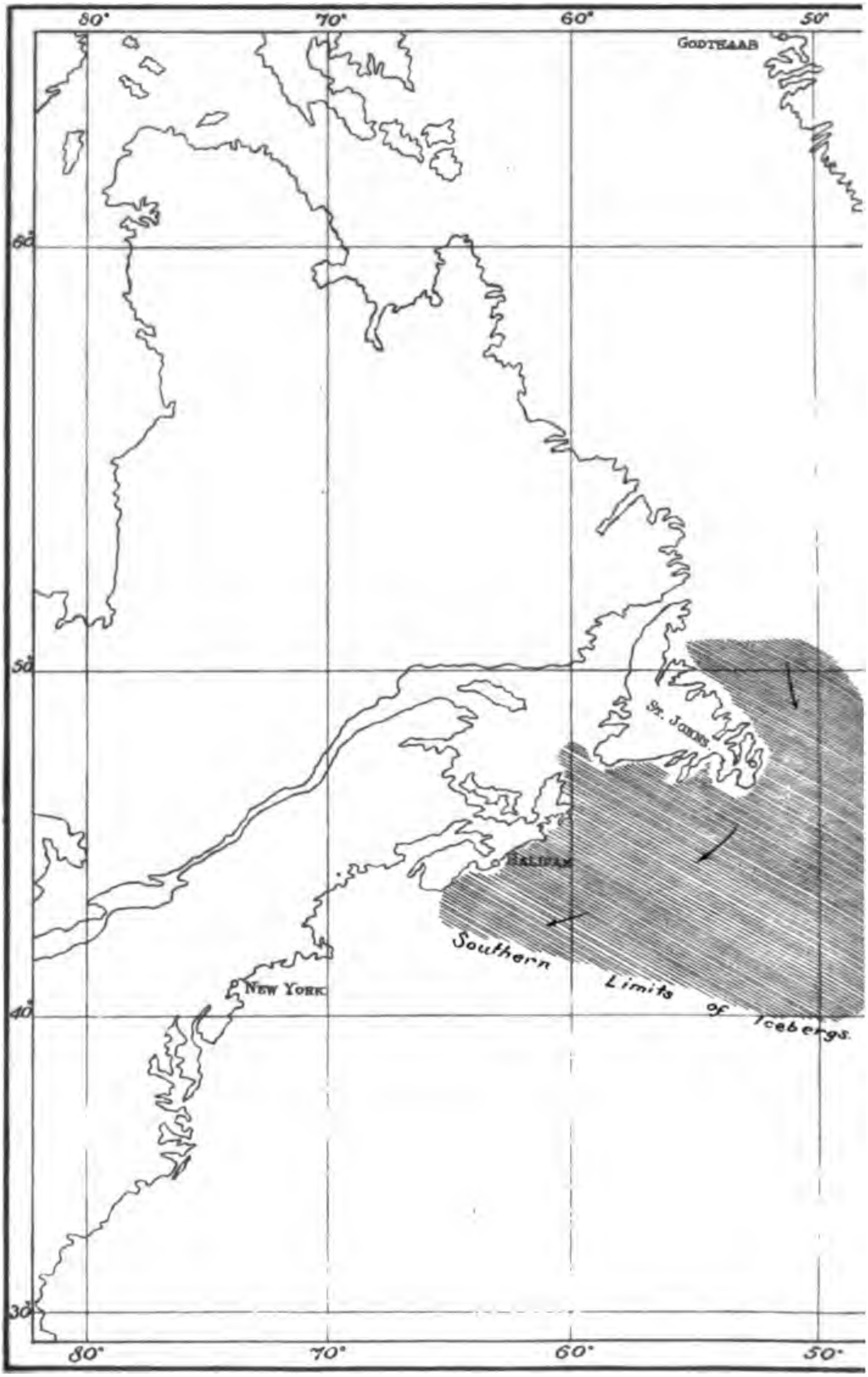
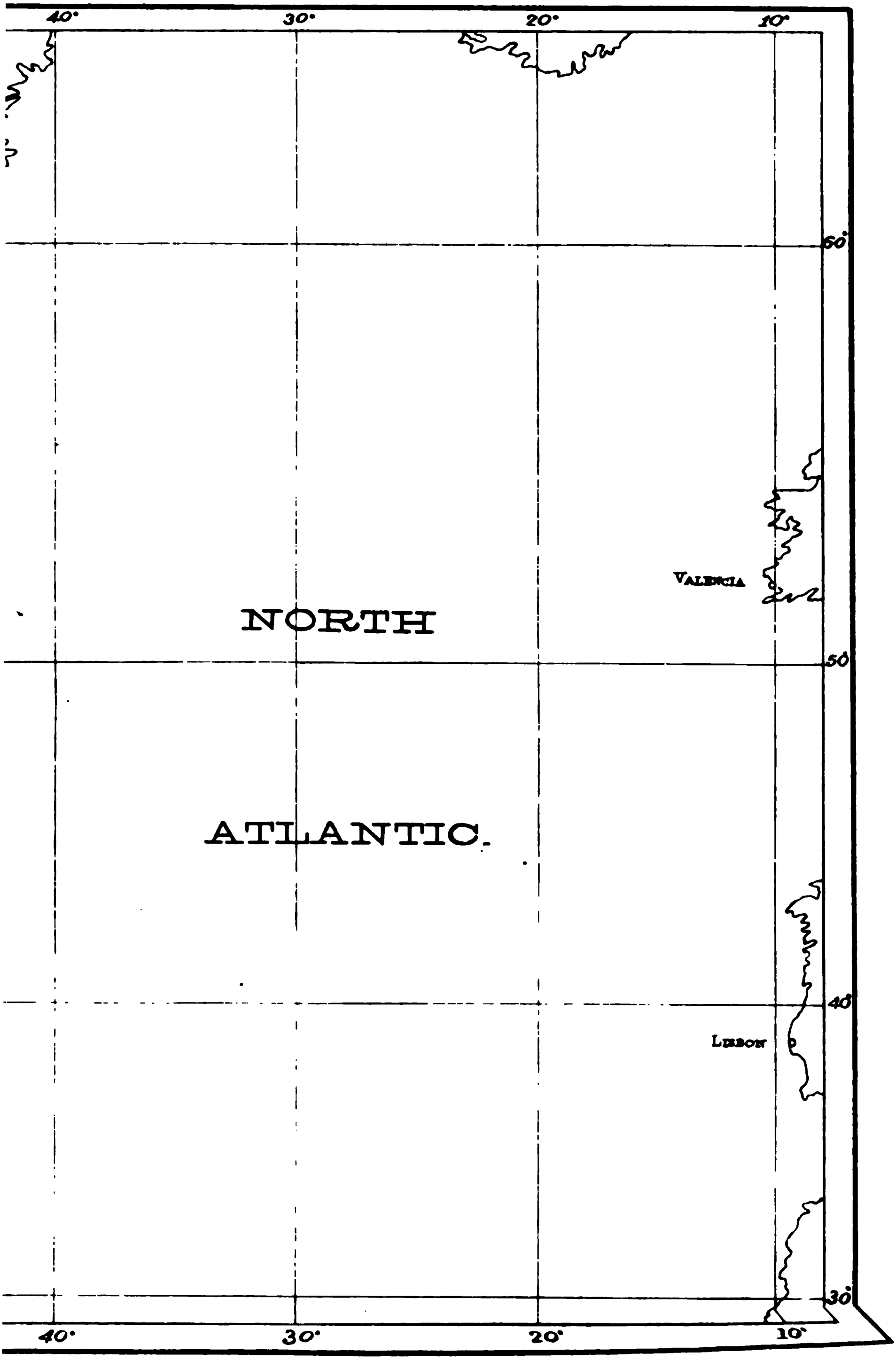


CHART SHOWING THE LIMIT OF ICEBERGS DURING THE MONTH OF M

OM OBSERVATIONS ON FILE IN OFFICE OF THE CHIEF SIGNAL OFFICER.



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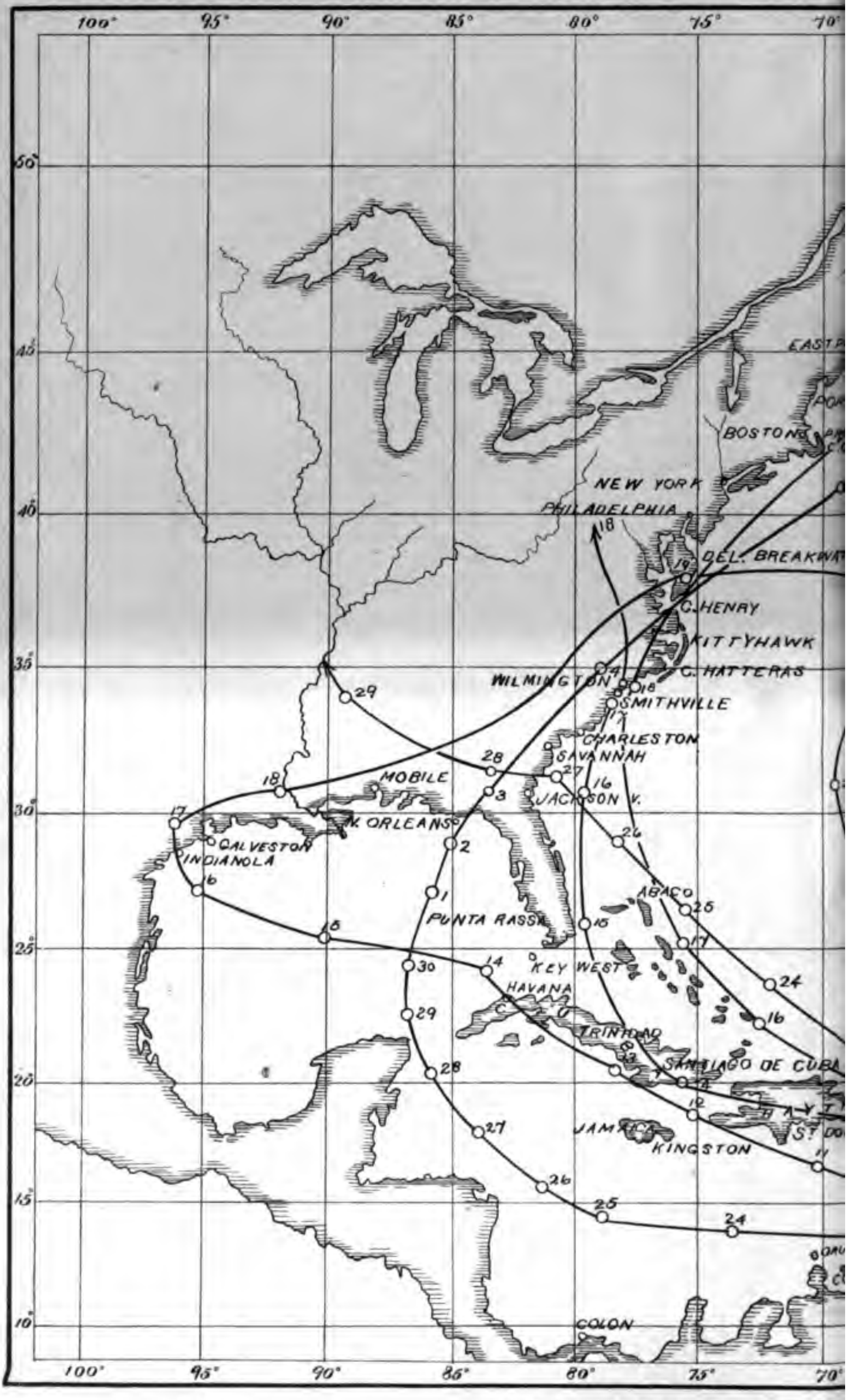
PRINCIPAL WEST INDIA HUR



WAR DEPARTMENT, OFFICE C

Date—May, 1882.	Number of new—		Disappeared by rotation.		Reappeared by rotation.		Total number of—		Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	
22, 4 p. m.	....	....	1	10	....	....	3	*10	Remainder disapp'd by rotation.
23, 4 p. m.	....	....	1	4	....	....	2	*6	Perhaps only one group of 1 large and 5 small spots.
25, 4 p. m.	....	....	....	2	1	1	3	3 1	Part of group disappeared by rotation.
26, 4 p. m.	....	....	2	2	....	....	1		Rest of group disappeared by rotation, and also the large spot.
29, 4 p. m.	....	....	....	....	1	1	2	2	
31, 4 p. m.	....	....	....	....			2	2	

24th, cloudy; otherwise, on omitted days, only the changes due to solar rotation were observed.
* Estimated.

Meteors.—Yuma, Ariz., 14th, 20th; Charleston, Ill., 16th; New Corydon, Ind., 9th, 16th; Vevay, Ind., 16th, 23d; Clinton, Iowa, 22, at 2.30 a. m. A large and brilliant meteor appeared in the heavens at a point a little south of west and at an elevation of 50°. It passed rapidly downward, and disappeared when about 10° above the horizon. During its passage it emitted a train of sparks, apparently several feet in length. Before its disappearance it broke into several fragments. Two distinct detonations were heard. Another meteor was also observed at this station on the 29th.

Monticello, Iowa, 23d, 24th; Yates Center; Kans., 8th; Woodstock, Md., 13th, 14th; Rowe, Mass., 7th; Thornville, Mich., 23d; Freehold, N. J., 3d; Weldon, N. C., 27th; Stateburgh, S. C., 16th, 19th, 23d, 27th.

Poar bands.—Laconia, Ind., 29th; New Corydon, Ind., 1st, 2d, 14th, 15th, 19th, 24th, 25th, 26th; Gardiner, Me., 8th; Freehold, N. J., 7th; Woodstock, Vt., 9th.

Earthquakes.—Pagosa Springs, Colo., 11th, at 8 p. m.: A slight shock of earthquake was felt at this place. It is also reported to have been felt in the mountains about 22 miles east of that place.

Zodiacal Light.—New Haven, 15th; Nashville, 5th, 10th, 15th to 19th, 22d; Monticello, Iowa, 15th, 16th; Yates Center, Kans., 5th, 8th, 15th, 16th; Cambridge, Mass., 5th, 6th, 7th, 15th, 16th; Atco, N. J., 7th, 16th, 18th; Waterburgh, N. Y., 5th, 7th, 15th, 16th; Dyberry, Pa., 26th.

Prairie and forest fires.—Port Huron, Mich., 9th; Moorhead, Minn., 4th, 5th, 6th; Saint Vincent, Minn., 4th; Fort Yates, Dak., 15th; Fort Stevenson, Dak., 24th; Yankton, Dak., 1st, 2d, 3d, 6th, 12th, 13th, 25th; North Platte, Nebr., 1st, 3d; Fort Brady, Mich., 17th to 20th; Creswell, Kans., 15th; Wytheville, Va., 2d, 3d, 17th.

Drought.—Fort Missoula, Mont., 16th; crops suffering for want of rain.

Insects.—Saint Meinrad, Ind., 31st: Great damage has been done to the hay crop by the cut-worm. Guttenburgh, Iowa, 31st: The chinch-bug has appeared in the wheat-fields in great numbers. Ardenia, N. Y., 31st: The Colorado beetle has appeared and is injuring potatoes. Ashwood, Tenn.: The army worm appeared during the first part of the month and did great damage to wheat, barley, and the meadows. A species of cut-worm also appeared and did considerably injury to cotton and garden vegetables. At the end of the month the army-worm disappeared. Little Rock, Ark., 12th: Farmers in this vicinity report that the cut-worm is doing great injury to crops. Nashville, Tenn., 13th: It is reported that the army-worm is doing considerable damage, especially in the eastern part of the State. Pike's Peak, Colo., 18th: Countless numbers of millers or moths appeared on the snow during the prevalence of a southwest wind. Hickman, Ky., 12th: Reports from many sections of the country show that the army-worm is very destructive, and is ruining wheat, meadows, and corn in many localities. Cairo, Ill., 10th: The army-worm is doing much damage to young potatoes and corn in the surrounding country. Huntsville, Ala., 5th: Army-worms have appeared in large numbers and are doing considerable injury to wheat. Chinch-bugs and army-worms are reported as doing much damage in Texas.

Sand-storms.—Stockton, Tex., 4th, 9th; Yuma, Ariz., 5th, 6th, 7th, 13th, 24th, 25th; Winnemucca, Nev., 9th; Umatilla, Oreg., 2d, 10th, 18th; Camp Thomas, Ariz., 2d, 5th, 19th, 20th, 25th, 26th, 29th, 30th; Lewiston, 12th.

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Brig. and Bvt. Maj. Gen'l, Chief Signal Officer, U. S. A.

APPENDIX No. 87.

MONTHLY WEATHER REVIEW, JUNE, 1882.

INTRODUCTION.

The meteorological data collected in this office during the month of June and until the 20th of July, 1882, has been carefully examined and a general summary of the several elements for each district in the United States is presented in this Review.

The temperature during the month of June averaged from 0.1 to 0.2 of a degree above the normal in the districts on the Atlantic coast; it rose slightly in all other districts east of the Rocky Mountains, and this increase over the low mean temperature of the previous month has been favorable to agricultural interests, especially in the eastern and southern sections of the country, where the crops have been greatly improved. The wheat crop has been secured in the southern districts, and harvesting was in progress as far north as the fortieth parallel at the close of the month. Heavy rains in the States north of the Ohio Valley and in sections of the Northwest injured the growing corn, and the late spring reduced the acreage of this crop, but the recent warm weather in these sections has greatly improved its condition.

On the Pacific coast the rainfall has been slightly below the mean for the month, except in southern California, and the wheat crop of Oregon and Washington Territory promises to be above the average, while that of California will probably fall slightly below the average.

The cotton region reports have been continued, and for the purposes of comparison the conditions of rainfall and temperature are given for the months April, May, and June. The warm weather of June in the cotton-growing regions has improved the condition of the crop in the Gulf and South Atlantic States. Reports from the Lower Mississippi Valley indicate that a good, but late, crop will be produced in the overflowed districts.

The month has been particularly marked by the occurrence of severe local storms and tornadoes, which in many cases caused great loss of life and property. These destructive storms occurred in almost every section of the country, but were most numerous in the States of the Upper Mississippi and Lower Missouri Valleys. The tornado which occurred in eastern Iowa on the night of the 17th was the most destructive storm of the month.

Ocean ice continued in the north Atlantic during the month, but it will be seen from the chart that the area within which vessels have reported ice or icebergs is not so large as in the previous month, although icebergs were observed in longitudes farther to the east than in either May or April. Several vessels were wrecked in the ice-fields of the North Atlantic during the month, and the chart may be of service in selecting the safe routes for vessels leaving the Atlantic ports. The vessel reports, which give the latitude and longitude in which ice was observed, will be found under the heading of Ocean Ice. Under the same heading is given an interesting extract of an article written by Mr. E. Douglas Archibald, in which the writer discusses the subject of ocean ice, and gives its years of maximum frequency, compared with the years of maximum sun spots.

That part of the Review referring to International Meteorology presents the general weather conditions which prevailed over the northern hemisphere during the month of April, 1880, and the tracks of barometric minima for July, 1880, traced from simultaneous observations taken at 7.35 a. m., Washington mean time. The month of April was chiefly remarkable for the high temperatures which prevailed in central Europe, and as an interesting feature of Chart V may be mentioned the tracing of the first typhoon of July, 1880, occurring in the China Sea.

In the preparation of this Review the following data have been used, viz, the regular tri-daily weather charts, containing the data of simultaneous observations taken at 136 Signal Service stations and 14 Canadian stations, as telegraphed to this office; 180 monthly journals and 171 monthly means from the former and 14 monthly means from the latter; 180 monthly registers from voluntary observers; 48 monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the New York Herald Weather Service; abstracts of ships' logs, furnished by the publishers of the New York Maritime Register; monthly reports from the local weather services of Kansas, Nebraska, and Missouri, and of the Central Pacific Railway Company; trustworthy newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The distribution of mean atmospheric pressure for the month of June, 1882, is shown by isobarometric lines in black on Chart No. II.

The area of lowest mean pressure occupies the region north of New England, extending over the Lower Saint Lawrence Valley, and the second depression extends over the Rocky Mountain regions, the pressure being least in Arizona. Compared with the previous month the pressure has diminished from 0.1 to 0.15 of an inch in the Lake region and from 0.1 to 0.2 of an inch in New England, the Middle States, and Saint Lawrence Valley. On the Pacific coast the pressure has fallen slightly, the distribution of pressure remaining unchanged. The low area in the Rocky Mountain region occupies about the same position as that of May, but the isobar of 29.80 includes within its limits Arizona, New Mexico, Colorado, and Utah, and parts of Nevada, Nebraska, Wyoming, and Idaho.

Departures from the normal values for the month.—Compared with the means of June of previous years, the pressure differs slightly from the normal in the Southern States and at the Rocky Mountain stations, and it is from 0.05 to 0.01 below the normal in New England and the Middle States. It is also slightly below the normal on the North Pacific coast.

BAROMETRIC RANGES.

The barometric pressure during the month of June has varied from 0.18 of an inch to 0.9 of an inch, the least range being at Campo, Cal., and the greatest range being at Escanaba, Mich.; generally the range increases with the latitude, and, on the same latitude, the range on the Pacific coast is equal to about one-half the range on the Atlantic coast.

In the several districts the barometric ranges have been as follows: *New England:* 0.8 inch at Portland, 0.81 inch at Springfield, and 0.68 inch at the summit of Mount Washington. *Middle Atlantic States:* 0.86 inch at Albany, 0.62 inch at Norfolk. *South Atlantic States:* 0.58 inch at Kittyhawk and 0.40 inch at Jacksonville. *Florida Peninsula:* 0.25 inch at Key West and 0.34 inch at Cedar Keys. *East Gulf States:* 0.52 inch at Starkville and 0.49 inch at Montgomery. *West Gulf States:* 0.67 inch at Little Rock and 0.33 inch at Brownsville. *Ohio Valley and Tennessee:* 0.61 inch at Memphis, 0.54 inch at Cincinnati, and 0.51 inch at Knoxville. *Lower Lake region:* 0.77 inch at Oswego and 0.63 inch at Cleveland. *Upper Lake region:* 0.90 inch at Escanaba and 0.72 inch at Chicago. *Upper Mississippi Valley:* 0.89 inch at Saint Paul and 0.68 inch at Davenport. *Missouri Valley:* 0.84 inch at Yankton and 0.68 inch at Springfield. *Extreme Northwest:* 0.75 inch at Moorhead and 0.58 inch at Saint Vincent. *Northern Slope:* 0.69 inch at North Platte and 0.51 inch at Cheyenne. *Middle Slope:* 0.62 inch at Dodge City and 0.45 inch at Pike's Peak. *Southern Slope:* 0.67 inch at Henrietta and 0.38 inch at Stockton. *Northern Plateau:* 0.53 inch at Umatilla and 0.34 inch at Dayton. *Middle Plateau:* 0.41 inch at Salt Lake City and 0.37 inch at Winnemucca. *Southern Plateau:* 0.39 inch at Santa Fé and 0.27 inch at Silver City. *North Pacific Coast region:* 0.52 inch at Portland and 0.42 inch at Olympia. *Middle Pacific Coast region:* 0.43 inch at Red Bluff and 0.30 inch at San Francisco. *South Pacific Coast region:* 0.32 inch at Yuma and 0.18 inch at Campo.

Areas of high barometer.—Four areas of high barometer have been traced over the eastern part of the United States during the month of June. They were first observed in the region north of the Upper Missouri Valley, or north of Lake Superior, and moved to the southeast over the Atlantic, developing but slight energy and causing no unusual change in barometric pressure. In no case has an area of high pressure been traced to the west of the Rocky Mountains, while two such areas have apparently approached the North Pacific coast from the Pacific.

I.—The pressure was above the normal for the month in the region north of the Missouri Valley on the 1st and 2d, but the development of low area II on the eastern slope of the Rocky Mountains apparently retarded the movement of this area. The pressure increased in the western districts on the 4th, a slight excess of pressure appearing over Texas, while the greater pressure continued in British America, north of Dakota. A light "norther" occurred on the Texas coast on the 3d and 4th, in advance of this area, and on the 5th the pressure had increased to 30.20 and above in the Mississippi and Lower Missouri Valleys, the center of greatest pressure being near Springfield, Mo., on the morning of the 5th. The midnight report of the 5th showed that this area was extending eastward over the Southern States, the pressure having increased during the day at stations south of the Lake region, and the winds in the southwest shifting to easterly, with light rains in Texas, Indian Territory, and Kansas. At the midnight report of the 6th this area had moved to the east of the coast line, advancing slowly to the southeast, but the pressure continued high in the South Atlantic and Gulf States, with rain gradually extending eastward over the districts as the pressure diminished.

II.—This area appeared in British America, north of Lake Superior and Minnesota, on the 10th. It extended over the Lake region, Saint Lawrence Valley, and the Middle States, and on the morning of the 12th was central near Montreal, where the pressure was 30.25. At the afternoon report of the 10th this area was central off the Middle Atlantic coast, where the pressure continued high until the 14th, when it diminished in advance of low area IV. The pressure increased on the South Atlantic coast as this area passed over New England to the southeast, and when the barometer fell in the northern districts on the 14th the region of high pressure was transferred to the Gulf States, where the barometer continued relatively high until the 18th.

III.—This advanced from the northwestward over Lake Superior on the 19th, the isobar of 30.10 inclosing the Upper Lake region at the midnight report of that date. On the 20th this area was central over Lake Erie, and on the morning of the 21st over the Middle Atlantic States, inclosed by an isobar of 30.20, which extended from Cape Hatteras to Toronto, Canada. The pressure increased at stations on the Atlantic coast on the 21st, with cool, fair weather in New England and the Middle States, and without any marked change in the position of this area, which continued over the Middle States until the 22d, when it passed slowly to the southeast over the Atlantic, the barometer remaining high in the South Atlantic and Gulf States until the 28th.

IV.—Appeared north of the Lake region on the 29th, and extended over the Middle States and Saint Lawrence Valley, attended by cool northerly winds in these districts on the 29th and 30th. This area disappeared rapidly in advance of low area IX, which was moving eastward from the Upper Missouri Valley on the morning of the 30th.

Areas of high barometer appeared on the Pacific coast on the following dates, but i no case could they be traced to the east of the Rocky Mountains. On the 11th and 12th the pressure increased to 30.12 at Roseburgh and 30.14 at Portland, and continued high until the 18th, reaching the maximum, 30.22, on the 17th. During this period of high pressure on the North Pacific coast the barometer was below the mean for the month at the central and southern California stations, and over the Middle and Southern Plateau regions. On the 20th, a second area of high pressure advanced from the Pacific over Oregon and Washington Territory, accompanied by cool north to west winds and fair weather, which continued until the close of the month, the pressure in California remaining generally below the mean.

Areas of low barometer.—Nine areas of low pressure appeared within the limits of the Signal Service stations sufficiently well defined to render it possible to trace the movements of each during at least three consecutive tri-daily reports. On Chart I will be found the tracks of the center of these depressions, seven of which reached the Atlantic coast, passing to the east of the Saint Lawrence Valley, north of the mean track of the low areas of June. Two extended areas of low pressure developed in the Rocky Mountain regions, where they remained almost stationary for several days. The centers of these depressions have been approximately located, with a view of illustrating the continuance of low areas in the Rocky Mountain regions during summer months.

The following table gives the latitude and longitude in which each area was first and last observed, and the average hourly velocity:

Areas of low barometer.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
	° ′	° ′	° ′	° ′	
No. I	45 30	103 00	47 30	60 00	23.8
No. II	42 00	102 30	42 00	60 00	24.0
No. III	42 00	112 00	37 00	107 00	....
No. IV	37 30	103 00	50 30	69 00	30.5
No. V	47 30	93 00	47 00	77 30	28.1
No. VI	47 00	104 00	47 30	77 00	26.0
No. VII	46 30	109 00	40 00	102 00	....
No. VIII	48 00	86 00	48 00	59 00	31.0
No. IX	40 00	115 00	44 00	82 00	24.4

The noticeable feature of Chart I is the absence of storm tracks from the Southern States and Atlantic coast districts. No depression appeared south of the fortieth parallel of latitude, except on the middle Rocky Mountain Slope.

The following table gives the number of areas of low pressures during the month of June, since 1873:

June, 1873	10
June, 1874	9
June, 1875	7
June, 1876	6
June, 1877	11
June, 1878	10
June, 1879	9
June, 1880	13
June, 1881	6
June, 1882	9

I.—This depression developed in Dakota on the 29th of the preceding month, and passed slowly to the eastward over Minnesota and Michigan with increasing energy, causing dangerous winds on lakes Erie and Huron, cautionary signals having been displayed in advance. On the morning of the 1st this depression was central in the Saint Lawrence Valley, northwest of Montreal, where the barometer had fallen to 29.36. Heavy rains occurred in the districts on the Atlantic coast on the 1st, and dangerous southwest to northwest winds prevailed on the Atlantic coast from Eastport to Jacksonville. This storm apparently lost much of its energy after reaching the Atlantic, and when last observed, north of Nova Scotia, the pressure at the center had increased and the isobars were less crowded than they had been when the center of this disturbance was passing over the Lake regions. The following maximum wind velocities were reported during this storm: Hatteras, 52, SW.; Delaware Breakwater, 40, SW.; Cape May, 40, S.; Sandusky, 46, SW.; Smithville, 30, SW.; Cedar Keys, 31, S. A heavy southeast gale, accompanied by heavy rains, occurred near Cape Cod on the 1st, the wind reaching its maximum velocity about 11 a. m., when the tide was unusually high. Captain Gregson, of the steamship Circassian, reports, May 30, at 8.30 a. m., in latitude N. 47° 35′, longitude W. 57° 05′, barometer 29.53. The wind, which was easterly, force 4, with passing rain and fog, suddenly shifted to NW., SE. and back to SE., and then to SW., making this revolution several times, and the weather suddenly cleared up. About a mile from the ship the water appeared to curl up as if from the force of the wind, but at the ship the wind was nearly calm, or of force 1. The wind eventually settled down and blew from the ENE., force 7 to 8, and decreased in force toward noon.

The following reports, furnished through the co-operation of the New York Herald Weather Service, probably indicate the presence of this storm during its movement eastward over the ocean: steamship Lepanto, 2d, in N. 42° 32′, W. 56° 57′, barometer 29.83, WSW., force 6, drizzling rain; steamship P. Calland, 5th, in N. 41° 27′, W. 48° 30′, barometer 29.87, SSW., force 5, cloudy; steamship Adriatic, 4th, in N. 45° 05′, W. 39° 45′, strong head wind and sea; 6th, in N. 41°′52′, W. 52° 54′, strong SSW. wind and head sea.

II.—This depression was central in western Nebraska on the afternoon of the 1st, inclosed by an isobarometric line of 29.70 extending over the eastern slope of the Rocky Mountains, north of the Arkansas Valley, with rain at all stations in the upper Missouri Valley. On the morning of the 2d the center of disturbance had moved eastward to Omaha, and the depression extended southward to northern Texas, while the rain-area had moved eastward to Michigan and the Lower Ohio Valley. This storm continued its easterly course during the 2d and until the morning report of the 3d, passing over Iowa and Illinois with increasing energy, and accompanied by very heavy rains near the center of disturbance. A secondary depression formed over northern Texas on the 2d but disappeared as the original depression passed to the eastward. On the morning of the 3d, the course changed to the northeast, the center was near Chicago, and the disturbance passed over southern Michigan and the Lower Lake region, causing severe gales, barometer at the center falling below 29.50, and the storm becoming more clearly defined as a cyclonic disturbance. Heavy rain occurred in the Lake region on the 3d, accompanied by dangerous winds on lakes Michigan, Huron, and Erie. This storm passed to the north of the Lower Lake region, with decreasing force and increasing pressure at the center. At the midnight report of the 4th the barometer was low at all stations in the northeastern part of the United States and in the Saint Lawrence Valley, and the isobarometric lines indicated that this depression had moved eastward over northern New England. On the morning of the 5th, the center was near Eastport, the lowest isobar, 29.60, enclosing the center of disturbance and extending from Montreal to Halifax. The pressure continued low in the northeast during the 5th, and the winds in New England, and at stations northeastward, shifted to westerly, indicating the continued northeasterly movement of the depression. The following maximum velocities of wind occurred during this storm: Hatteras, 40 SW.; Delaware Breakwater, 43 S.; Milwaukee, 42 N.; Grand

Haven, 40 W.; Sandusky, 37 W.; Toledo, 36 W.; Detroit, 32 SW. Destructive local storms were reported in Virginia and North Carolina on the 4th, which were in some cases accompanied by hail. The following vessel reports, furnished through the co-operation of the New York Herald Weather Service, probably indicate the presence of this storm during its eastward movement over the ocean: 5th, steamship Gallia, N. 40° 37′, W. 70° 54′, barometer 29.79, SW., force 5, lightning; 6th, steamship City of Montreal, in N. 41° 37′, W. 63° 57′, strong head winds.

III.—The area of high barometer, which followed low area II, extended slowly over the districts east of the Mississippi, where the pressure continued relatively high until the 21st, while, at the Rocky Mountain stations, the barometer continued below the mean. The low area traced as III was a large barometric depression, generally inclosed by an isobar of 29.70, and including within its limits Colorado, New Mexico, and Utah. The position of the center of this depression has been located approximately at each report from the date of its appearance on the 12th. The barometer continued low in this region, from the 12th to the 13th, but the general distribution of pressure and direction of wind at the Rocky Mountain stations did not warrant the continuation of the track of this depression as a part of that traced as IV. A severe tornado occurred in Saint Clair County, Mich., on the 8th, when the pressure was lowest near Salt Lake City, but an examination of the weather chart of that date indicated the presence of a slight depression in the upper Mississippi Valley, with northerly winds over Lake Superior and southerly winds in eastern Iowa and southern Illinois. Very heavy winds occurred in Iowa on the 10th, when the barometer was lowest in Colorado.

IV.—This depression was central in eastern Colorado on the morning of the 13th, the barometer at Denver reading 29.62, and that at Cheyenne, 29.63, with northerly winds and light rain. This depression extended in a north and south direction, from Texas to northern Dakota, the winds being from east to south in the Mississippi and Missouri Valleys, accompanied by light rains. This area moved northward into western Nebraska during the day, inclosed by an elliptical isobar, the longer axis of which inclined slightly to the east, and extended from Santa Fé to Bismarck. The course changed to the eastward during the night of the 13th, and the center passed over southern Minnesota, central Wisconsin, and the southern part of Lake Superior on the 14th, the storm increasing in force and becoming more contracted as it approached the Lake region. The rain-area of this depression extended over the States north of the Ohio Valley, but the amount of precipitation was slight. After passing to the east of the Lake region over the Saint Lawrence Valley, the pressure diminished at the center, and the disturbance became more extended; rain fell in New England and the Middle Atlantic States as the center of this disturbance passed to the eastward and northward of these districts. At the 7 a. m. report of the 16th, when the center of disturbance was near Farther Point, the barometer at that station read 29.41; the following maximum velocities of wind were reported at stations on the lakes: Milwaukee, 36; Grand Haven, 38; Port Huron, 36; Sandusky, 25.

V.—This depression developed rapidly during the 16th, and was probably central near the western part of Lake Superior on the morning of that date. At the p. m. report of the 16th, it was central in Wisconsin as a slight disturbance, causing light rains in the Upper Lake region and thence southward to the Ohio Valley. This depression moved southeasterly until the center reached Lake Huron on the morning of the 17th, when the a. m. weather chart exhibited a trough of low pressure, extending from the Upper Saint Lawrence to the Upper Missouri Valley. This area became less defined during the 17th, and finally disappeared to the northeast of Lake Huron, the course changing after the morning report of that date. Light rains occurred in all districts east of the Mississippi on the 17th, when this depression was moving to the northeast of the lakes.

VI.—This depression was first observed as central in Dakota, at the midnight report of the 16th. It became more clearly defined during the 17th, as the center moved in a southeasterly direction, inclosed by an isobar of 29.50, at the p. m. report of the 17th. At midnight of the 17th the center of this storm had reached northern Iowa, the barometer at Des Moines reading 29.34, wind W.; Omaha, 29.44, wind NW.; Saint Paul, 29.42, wind E.; Huron, Dak., 29.46, wind NW.; at this report the depression was elliptical in form, the longer axis being in a north and south direction, inclining slightly to the westward. On the 18th the center passed to the northeast near Saint Paul, where the barometer fell to 29.24 at the 7 a. m. report, and at the same report the observer at Duluth reported barometer 29.41, violent NE. gale and heavy rain. This storm passed directly eastward over Lake Michigan, causing severe gales and heavy rains; after passing to the eastward of the Lake region, the pressure increased at the center, and the storm lost much of its energy before passing beyond the limits of observation. The succeeding reports indicate that it disappeared as a slight disturbance northeast of Nova Scotia on the 20th. Under the heading of local storms will be found a description of the tornadoes which occurred while this depression was passing over the northern part of the United States.

VII.—This depression was first observed in the Upper Missouri Valley on the morning of the 19th. The pressure continued below the normal in this region during the 19th and 20th, when the center of low pressure moved southward to Colorado, leaving a slight secondary depression in Dakota, on the afternoon of the 20th. This depression continued in Colorado until the midnight report of the 21st, when it disappeared before reaching the Missouri Valley.

VIII.—Was central north of Lake Superior on the 24th, and passed eastward over the Lower Saint Lawrence Valley, causing only a slight disturbance in northern districts of the United States. It was at no time within the limits of the Signal Service stations, and the position of the center is only approximately located at the tri-daily telegraphic reports.

The following report, furnished by Captain Moody, of the steamship State of Georgia, probably indicates the presence of this storm: 26th, in N. 41° 01′, W. 56° 27′, barometer 29.76, wind SW., force 7, heavy rain.

IX.—An extended area of low pressure was central in the southern Plateau Region, on the morning of the 27th; this depression moved slowly to the eastward over Utah and Colorado, during the 27th and 28th, when its course changed to the north. On the morning of the 29th it was central near Deadwood, Dak., where the barometer was slightly below 29.70; on this and the following day this disturbance moved directly eastward over the Lake region, with increasing energy, and at the close of the month it was central near Saugeen, where the barometer read 29.57. Cautionary signals were ordered at stations on Lakes Michigan, Huron, and Erie, in advance of this storm; these signals were justified by dangerous winds on Lakes Erie and Huron, but they were not justified at stations on the southern and western shores of Lake Michigan.

INTERNATIONAL METEOROLOGY.

International Charts IV and V accompany the present number of this Review. Chart IV is published for April, 1880, and continues the series of that chart begun in January, 1877. Chart V is prepared for July, 1880, and continues the series of that chart from November, 1877. In the description of these charts much valuable information has been obtained from the Monatliche Uebersicht der Witterung, published by Prof. Dr. G. Neumayer, director of the German Marine Observatory, and from the Bulletin Mensuel, published by Mr. Marc Dechevrens, of Zi-Ka-Wei, China.

Chart IV exhibits the mean pressure, mean temperature, and prevailing direction of the wind over the northern hemisphere for the month of April, 1880, as determined from one observation taken each day at 7.35 a. m., or 0.43 p. m., Greenwich mean time.

The area of lowest mean pressure occupies southeastern Greenland, the mean pressure at Godthaab being 29.54 (750.3 m. m.), prevailing wind south, force 4. The barometric gradients increase slowly toward the east and southeast, but in the south the increase is more rapid. A second area of mean low barometer extends over British India, where the lowest mean pressure for the month was 29.63 (752.6 m. m.). An area of relatively mean low pressure, 29.90 (759.4 m. m.), extends over the United States from the Lake region southward and westward to the Rocky Mountains. The isobar of 29.90 (759.4 m. m.) also covers the European continent from northern Russia southward to the Black Sea and the Mediterranean, and westward to the North Sea and Bay of Biscay. Three areas of barometric maxima appear on the chart.

The first area of mean high barometer, 30.20 (767.7), is that of the Atlantic, which extends over the ocean, between the parallels of 20° and 40° N., and between the meridians of 20° and 50° W. In Asia, the isobar of 30.10 (764.5) appears in southern Siberia, and encloses the provinces of Tomsk and the southern part of Yeneseisk. An area of high pressure, 30.10 (764.5), also covers the eastern part of China, while a second area of 30.10 extends from the western coast of Japan nortwestward over Corea toward Irkutsk. In North America, the high area of the Pacific appears over California, where the mean pressure ranges from 30.04 (763.0) to 30.10 (764.5), and the isobar of 30.00 (762.0) covers the territory from Manitoba northward to Hudson's Bay. Compared with the preceding month, the pressure has remained nearly stationary over Greenland, the mean barometer being 0.01 inch below the mean for March. The pressure has increased over Russia; the area of low barometer 29.60 (751.8), which was central over that country during March, is this month replaced by the isobars of 29.90 (759.4), and 30.00 (762.0). In central Europe, the pressure has decreased, the isobars of 30.20 (767.1), and 30.10 (764.5) of March being now replaced by the isobar of 29.90 (759.4). In eastern Asia, the pressure has averaged about 0.10 inch below the mean for March, while the area of 30.20 (767.1) has moved into Siberia. In the United States, the pressure has generally decreased throughout the country, except in Florida and in parts of Alabama and Georgia. On the North Pacific Coast, the pressure was about 0.07 inch below the mean of the preceding month. Compared with the corresponding month of previous years, the pressure was below the normal in Iowa, Minnesota, and the Lake region, while it was correspondingly above the normal in the Middle and South Atlantic States and in Georgia and Alabama. On the North Pacific Coast, a deficiency occurred, ranging from 0.02 to 0.09 inch, while in California the pressure was from 0.02 inch to 0.11 inch above the normal. In Canada, the pressure was generally below the normal.

The following table exhibits the mean pressure and the mean temperature for the month of April, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during April, 1877, 1878, and 1879:

Countries.	Mean barometer.			Mean temperature.		
	April, 1877-'78-'79.	April, 1880.	Departure.	April, 1877-'78-'79.	April, 1880.	Departure.
Algeria	29.97	29.98	+0.01	66.6	67.3	+ 0.7
Austria	29.76	29.86	+0.10	56.3	61.6	+ 5.3
British Isles	29.78	28.85	+0.07	49.2	50.5	+ 1.3
Denmark	29.84	29.89	+0.05	44.8	48.8	+ 4.0
France	29.77	29.89	+0.12	57.1	56.5	− 0.6
Germany	29.81	29.91	+0.10	50.2	54.2	+ 4.0
India	29.76	28.71	−0.05	89.1	90.2	+ 1.1
Italy	29.81	29.90	+0.09	61.6	62.9	+ 1.3
Norway	29.91	29.85	−0.06	44.5	45.9	+ 1.4
Portugal	29.99	29.98	−0.01	60.2	59.7	− 0.5
Russia	29.89	29.98	+0.09	47.1	46.8	− 0.3
Spain	29.89	29.95	+0.06	62.0	59.5	− 2.5
Sweden	29.90	29.89	−0.01	38.9	41.2	+ 2.3
Turkey	29.87	29.96	+0.09	63.8	50.8	−13.0

In North America, the temperature was above the normal, from Texas and the Mississippi River, eastward to the Atlantic, except in the Canadian maritime provinces, where it was slightly below the normal. Over the entire country west of the 100th meridian it was below the normal, except in Kansas and Colorado. The greatest excess of temperature occurred in the Middle Atlantic States, and the greatest deficiency prevailed in the Missouri Valley. On the Pacific coast, the greatest deficiency occurred in the central region. In central Europe, the temperature was everywhere above the normal, except in France, where it was slightly below, the greatest excess appearing in Austria and Germany. In Russia the temperature was below the normal.

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of April, 1880, as compared with the means of three years:

Comparative thermometric and barometric means, with corresponding departures.

Station.	Mean barometer.			Mean temperature.		
	April, 1877-'78-'79.	April, 1880.	Departure.	April, 1877-'78-'79.	April, 1880.	Departure.
				°	°	°
York Factory	30.10	30.08	−0.02	16.6	1.3	−15.3
Godthaab	29.91	29.54	−0.37	28.9	27.1	− 1.8
Stykkisholm	29.87	29.62	−0.25	31.1	42.6	+11.5
Tromso	29.86	29.67	−0.19	33.4	33.1	− 0.3
Thorshavn	29.91	29.76	−0.15	42.8	46.2	+ 3.4
Archangel	29.94	29.84	−0.10	33.1	32.9	− 0.2
Ekaterinburg	29.94	29.98	+0.04	41.8	36.9	− 4.9
Barnaul	30.07	30.17	+0.10	39.1	31.1	− 8.0
Yeniseisk	29.98	30.07	+0.09	30.9	32.2	+ 1.3
Nikolaievsk on the Amoor	....	....	....	20.7	23.0	+ 2.3
Zi-Ka-Wei	30.06	30.10	+0.04	55.0	52.5	− 2.5
Pekin	30.01	30.07	+0.06	56.4	56.8	+ 0.4
Beirut	29.92	29.91	−0.01	71.4	67.5	− 3.9
Mauritius	29.99	30.02	+0.03	78.9	79.3	+ 0.4
Paramaribo	29.99	30.04	+0.05	81.2	81.1	− 0.1
Funchal	30.14	30.15	+0.01	65.5	63.9	− 1.6

Comparative thermometric and barometric means, with corresponding departures.—Continued.

Station.	Mean barometer.			Mean temperature.		
	April, 1877-'78-'79.	April, 1880.	Departure.	April, 1877-'78-'79.	April, 1880.	Departure.
				°	°	°
Ponta Delgado	30.03	30.24	+0.21	64.1	62.2	— 1.9
Bridgetown	30.02	30.02	Normal	83.4	80.2	— 3.2
Navassa	29.96*	30.16	+0.20	80.2*	77.3	— 2.9
Melbourne	30.15	30.12	—0.03	58.0	59.4	+ 1.4
Hobart Town	29.94	30.01	+0.07	62.9	57.1	— 5.8
Astrakhan	29.95	30.09	+0.14	59.3	48.2	—11.1
Athens	29.86	29.93	+0.07	68.1	66.7	— 1.4
Tiflis	29.88	29.97	+0.09	65.1	59.7	— 5.4
Laghouat	30.03	29.96	—0.07	72.3	71.2	— 1.1
Fort-de-France	29.84	30.22	+0.38	80.4	77.2	— 3.2
Lisbon	30.00	30.02	+0.02	59.9	59.5	— 0.4
Sandwick Manse	29.88*	29.78	—0.10	44.2	46.8	+ 2.6
Malta	29.87	29.91	+0.04	65.6	52.2	—13.4
Gibraltar	30.00	30.00	Normal	66.1	65.4	— 0.7
Tashkend	30.04	30.04	Normal	66.1	62.4	— 3.7
Cape Town	30.06	30.05	—0.01	72.8	70.3	— 2.5
Angra	29.99	30.26	+0.27	60.6	63.3	+ 2.7
Cagliari	29.81	29.87	+0.06	63.9	62.8	— 1.1
Free Town	29.92	29.89	—0.03	87.5	87.4	— 0.1
Madrid	29.89*	29.92	+0.03	60.4	56.3	— 4.1
Nukuss	29.92	30.03	+0.11	68.1	57.9	—10.2
Nassau	30.03	30.15	+0.12	75.8	77.5	+ 1.7
Havana	29.96*	30.15	+0.19	75.9*	75.2	— 0.7
Mexico	29.97*	30.12	+0.15	54.4*	53.8	— 0.6
Lahore	29.86*	29.63	—0.23	89.5*	96.3	+ 6.8
Tokei	30.07	30.08	+0.01	53.1	52.0	— 1.1
San Juan de Puerto Rico	30.00	30.12	+0.12	77.3	77.2	— 0.1
San José de Costa Rico				69.3	66.6	— 2.7

*April mean for two years only.

The following table shows some of the extreme monthly mean temperatures, reported from isolated stations:

Lowest.	Degrees.	Highest.	Degrees.
York Factory	+ 1.3	Freetown	87.4
Moose Factory	21.6	Manilla	83.1
Nikolaievsk on the Amoor	23.0	Paramaribo	81.1
Fort Garry	23.8	Bridgetown	80.2
Godthaab	27.1	Puerto Berrio	79.8
		Mauritius	79.8

In British India, the temperature was slightly above the mean, the highest monthly mean reported being 100°.8 (+38°.3 cent.) at Deesa, and the lowest, 75°9 (+24°.3 cent.) at Sibsagar.

The prevailing direction of the wind over North America was, north of the 40th parallel, northwesterly, except in the Lake region and on the New England coast, where it was southwest and south or southwest respectively. South of the 40th parallel the prevailing direction was generally southerly and southwesterly; on the Pacific Coast it was southeasterly, except at San Diego and Los Angeles, where the prevailing direction was northerly. In Canada the winds were northerly to westerly. In Europe, the prevailing directions were as follows: In Germany, northerly to northeasterly; in France, northeasterly to northwesterly; in Austria, southerly to southeasterly; in Denmark, Sweden, and Norway, generally southwesterly. In Algeria, the winds were northwesterly; in Hindostan, northwesterly, and in China and Japan they were generally northeasterly. Over the North Atlantic, south of 35° N., and between 20° and 70° W., the winds were northeasterly; north of 35° N., and between 20° and 60° W., they were generally southwesterly, and north of 30° N., and between 10° and 20° W., they were northeasterly.

The following brief notes, descriptive of the meteorological conditions over Europe during the month, are gathered from the Monatliche Uebersicht der Witterung: During the first week, the area of high barometer, which was central over Lapland, moved slowly eastward with increasing pressure, and formed steep gradients in connection with an area of low barometer then central over the British Isles and North Sea. On the morning of the 3d, the barometer over the Hebrides was 29.13 (739.9); at Hernosand, it was 30.34 (770.6), and at Archangel 30.80 (782.3); southward, the barometer at Helgoland, was 29.41 (748.1); at Cherbourg, 29.65 (753.2), and at Biarritz 30.02 (762.5). Stormy easterly winds prevailed on the Norwegian and Swedish coasts, and strong westerly winds on the western coast of France. The noteworthy features of the month were, first, the unusually large number of barometric minima which prevailed over northwestern Europe, but these were in general of short duration, and developed only slight energy; they were accompanied in most cases by thunder and hail storms; second, the extreme high temperature recorded between the 15th and 24th of the month, in some cases being as high as recorded during the summer months. The following maximum temperatures were reported in Germany: At Aschaffenburg, 82°.2 (27°.9 cent.); Berlin, 81°.3 (27°.4 cent.); Magdeburg, 79°.3 (26°.3 cent.). From the 27th to the end of the month, the temperature fell rapidly, and severe frosts, injuring vegetation, occurred throughout the northern part of central Europe. On the 29th and 30th, the minimum temperatures of the month occurred, 22°.1 (—5°.5 cent.), being reported from Oberweisenthal (altitude of station, 927 meters, or 3,041 feet), and 27°.9 (—2°.3 cent.) from Potsdam.

Chart V exhibits the paths of barometric depressions which have been traced from the daily international charts for the month of July, 1880, supplemented by vessel reports from the North Atlantic. The data are charted for each day of the month, on the charts accompanying the International Bulletin for that day, and from these charts and additional reports the movement of the centres of barometric minima are traced. Twenty-three storm-areas, occurring in the northern hemisphere, have thus been traced.

Concerning the general distribution of these depressions, the following is given: Seven appeared in the United States and Canada, two of which are traced to the Atlantic, but, during this month, no storm appeared sufficiently well-defined, after leaving the American coasts, to warrant its being traced as a continuous storm across the ocean. Twelve depressions appear over Europe, and these in general exhibited but slight energy during their prevalence. Four depressions are traced in Asia, extending from the coast of China generally in a northeasterly course over Japan. On this chart will also be found a tracing of the first typhoon that occurred in the China Sea during the month of July, 1880, a detailed description of which is given below.

The following brief descriptions are given of the storms first appearing within the limits of the Signal Service stations:

I.—This depression was central in Kansas on the 1st, and during the 2d and 3d it moved in a north-northeasterly course towards Lake Superior, and on the 4th it passed into the British Possessions and beyond the limits of the stations of observations. During the early part of its course, this storm was accompanied by heavy rains and severe thunder-storms.

II.—This area probably developed in Colorado during the 3d, and on the 4th and 5th it moved in an east-northeasterly direction over the Lake region, and thence down the Saint Lawrence Valley, where it disappeared on the 6th. This storm exhibited considerable energy during its eastward movement through Kansas and Nebraska, and was accompanied by severe thunder and hail storms. At North Platte, Nebraska, the wind reached a velocity of 80 miles per hour from the northwest, and heavy rains were reported from Dodge City, Kans.

III.—This disturbance first appeared in Montana on the 6th, and moving eastward at an average velocity of about 15 miles per hour, was probably central on the morning of the 8th, near Fort Garry, barometer 29.58 (m. m. 751.3), a fall of 0.30 inch in twenty-four hours. Continuing its course, which was now north-northeasterly, the center was probably north of Moose Factory on the 9th. On the 10th, the storm-center moved in a southeasterly direction over the Gulf of Saint Lawrence, and disappeared on the 11th over the Atlantic.

IV.—This depression first appeared in Utah on the 10th, and moved eastward during that day and the following, causing threatening and stormy weather in Colorado, Montana, and Nebraska. The lowest pressures for the month occurred in the States just mentioned, during the passage of this storm. On the 12th, the depression moved northeastwardly and was central near Duluth. During the 13th, this low-area moved in a southeasterly direction over Lake Superior to the New England coast, and was attended by local rains and occasional high winds. On the 14th, the center passed off the coast to about N. 43°, W. 60°, the U. S. ship Portsmouth, in N. 42° 38′, W. 60° 00′, reporting barometer 29.57 (m. m. 751.1)., wind SSW., force 5, raining. On the 15th, the storm pursued a north-northeasterly track and disappeared south of Greenland.

V.—This appeared in Manitoba on the 15th, and passed eastward with its center north of the Lake region on the 16th. On the 17th it moved in a northeasterly course down the Saint Lawrence Valley, and on the 18th disappeared beyond the stations of observation.

VI.—This area probably developed during the 18th, and on the 19th moved by an easterly course through Iowa. Its course then changed to the northeastward, and moving over the Lake region on the 20th, its center was near Rockliffe, Ontario, barometer, 29.68 (m. m. 753.9), a fall of 0.36 inch in twenty-four hours. During the 20th and 21st the center moved northeastward, and disappeared beyond the stations of observation.

VII.—This depression developed north of York Factory on the 24th, and on the 25th and 26th it moved eastward over Canada. The path of this storm-center was too far north to admit of its being more fully described. The weather over the North Atlantic Ocean during this month was unusually free from storms. West of the 50th meridian, high barometer, with light winds, prevailed, attended by occasional rains and thunderstorms. Between 50° and 30° W. the winds were variable, and high barometer and generally fine weather prevailed. During the night of the 1st and 2d, in N. 36°, W. 37°, a hurricane occurred, lasting 2½ hours, barometer 29.72 (m. m. 754.9), wind S. to W. and NNW. East of 30° W., the weather was generally fine, with fresh southwest and northeast winds and barometer generally high, except over the English Channel. Of the storms occurring over Europe, the following is given, supplemented by notes from the Monatliche Uebersicht der Witterung, published by Prof. Dr. Geo. Neumayer, director of the German Marine Observatory at Hamburg:

VIII.—This first appeared in Sweden on the 1st, and, pursuing a somewhat unusual course toward the northwest, passed into Norway, and on the 2d the storm was probably central near Bronö, barometer 29.48 (m. m. 748.7). The center of disturbance then followed a northeasterly course toward Tromso, the barometer at that station reading 29.48 (m. m. 748.8) on the morning of the 3d. On the following day the storm passed in an easterly direction over the Arctic Ocean.

IX.—This depression was central off the western coast of Scotland on the 2d, and moved across that country in an east-southeasterly direction toward the North Sea, where it was central on the 3d. On the 4th, it reached the northwestern coast of Germany, causing stormy westerly winds and rain. During the 5th and 6th it passed over the southern part of Norway to the ocean, where it disappeared.

X.—This disturbance probably developed in the north of Scotland on the 7th, and during the 8th and 9th it passed northeastward over the North Sea to the Arctic Ocean.

XI.—This was central near Yarmouth on the 9th, and moved in a northeasterly course along the coasts of Germany and Denmark. On the 10th the center was probably near Fanöe, and, continuing its northeasterly movement during the 11th and 12th, it passed through Sweden and Norway and finally disappeared in Finland.

XII.—This storm first appeared on the 10th, near the Orkney Islands, and, pursuing a northeasterly course, disappeared off the Norwegian coast on the 11th.

XIII.—This disturbance developed in northern Norway on the 15th, and moved by a southeasterly course across the White Sea; on the 16th, the storm-center was near Archangel, barometer 29.62 (m. m. 752.3), a fall of 0.20 inch in twenty-four hours. On the 17th its course changed slightly to the northward, and on this day the storm probably disappeared in the Valley of the Obi.

XIV.—This appeared in Scotland on the 18th, Glasgow barometer 29.82 (m. m. 757.4), wind west, squally; on the 19th the center of disturbance crossed the North Sea in an east-northeasterly course to Norway; passing thence southeastwardly it crossed the Baltic on the 20th, and was probably near Memel on the 21st. On the 22d the storm-center reached Moscow, barometer 29.50 (m. m. 751.6), where it disappeared or became merged in low area XV.

XV.—This depression developed over the Black Sea on the 18th or 19th, and moving northeastwardly was central on the morning of the 20th near and north of Kasan, barometer 29.26 (m. m. 743.2). During the 21st the storm apparently curved to the westward, and on the 22d was central near Archangel, barometer 29.28 (m. m. 743.7). On the 23d the storm recurved and resumed its northeasterly course, disappearing in the Valley of the Obi.

XVI.—This storm appeared on the western shores of the Black Sea on the 23d, and on the 24th was central over the Sea of Azov. Following a northeasterly course during the 25th, 26th, and 27th it was central near Ekaterinburg, 29.16 (m. m. 740.6), on the last-named date, and on the 28th it disappeared in the Valley of the Obi.

XVII.—On the 24th there was a decrease of pressure in southern Sweden, and on the 25th and 26th the disturbance passed into northern Russia, where it disappeared.

XVIII.—This depression developed over the North Atlantic Ocean, south of Ireland, on the 26th, and, passing over England and western Europe at an average velocity of 45 miles per hour, was central near Posen on the 27th, the barometer at that station reading 29.41 (m. m. 747.1). During the 28th and 29th it followed an easterly course through Russia, and disappeared on the latter date.

XIX.—This storm apparently developed on the 27th in about N. 47°, W. 18°, and passing northeastward skirted the west coasts of Ireland and Scotland. On the 28th the center was probably near Galway, barometer 29.47 (m. m. 748.5). On the 29th and 30th it passed to the northward of the Shetland Islands, where it finally disappeared. It is worthy of note, in connection with the storms occurring over western Europe during the month, that they were generally accompanied by severe thunder-storms and continuous rains, the rainfall for the month in northwestern Europe being slightly above the normal.

Of the storms appearing over Asia, the following is given:

XX.—This probably developed in the interior of China, and passed near Shanghai on the 6th and 7th, and was accompanied by severe thunder-storms and heavy rains. On the 7th and 8th the storm moved slowly northeastward over Japan; at midnight of the latter date 0.31 inch of rain fell in fifteen minutes at Zi-Ka-Wei. In connection with this depression Mr. Marc Dechrevens, of the Zi-Ka-Wei Observatory, reports the occurrence of a violent storm on the 4th and 5th: The storm first appeared in the north-northwest and pursued a south-southeasterly course through the districts of Kwa-Chow, Chang-Choo, and Yang-che-fou, in the province of Kiang-Su. During its path through these districts it caused great destruction to life and property; churches were blown down and trees uprooted, city walls demolished and dwellings unroofed, and many persons were killed; several junks and other vessels were destroyed or damaged. The Chinese newspapers report a rainfall of nine inches during the morning at Yang Chow. On the arrival of the storm at Shanghai it appeared to have lost much of its energy although still severe. The above-mentioned storm does not appear on the international charts, but it is probable that it was closely connected with low area XX during the early development of that storm.

XXI.—This disturbance appeared in the north of China on the 10th. Its influence was felt at Zi-Ka-Wei, where it caused heavy rains; during the 11th and 12th it passed northeastward over Corea and Japan to the ocean.

XXII.—This depression developed to the east of Zi-Ka-Wei on the 21st and 22d, and passed thence northeastward over southern Japan; Nagasaki barometer, 29.47 (m. m. 748.5). It passed over the island of Niphon during the 23d, and was probably near Tokei on that day; on the 24th it disappeared northeastward over the ocean.

XXIII.—This apparently developed in the region northwest of Zi-Ka-Wei during the 22d, and following a south-southeasterly course, was central on the 23d in about N. 30°, E. 126°. Its course then changed to the eastward, and the storm-center passed south of Japan on the 24th; on the 25th it was probably central near N. 33°, E. 135°, the U. S. steamer Richmond reporting in N. 34°, E. 135°, barometer 29.58 (m. m. 751.3). During the 26th and 27th it passed northeastward and disappeared on the latter date. In connection with the weather in China, during the month under consideration, may be mentioned the prevalence of northeast winds. The means of seven years show the resultant direction of wind in July to southeast, while the mean direction during the present month was northeast. Instead of the usual torrid heat, the month was relatively cool and agreeable. The following description of the first typhoon of July, 1880, is taken from the Bulletin Mensuel, published by Mr. Marc Dechevrens, of the Zi-Ka-Wei Observatory. This typhoon prevailed from the 13th to the 19th, and probably developed between the islands of Borneo and Mindanao. It followed a northwesterly course, crossing the parallels of 10° and 20°, the first in longitude 120° E., and the second in 107° E., and traversed the island of Hainan and the Gulf of Tonquin. Its average velocity was 8 miles (thirteen kilometers) per hour, which is about the usual velocity of the southern typhoons. It will be noted that the velocity and direction of the movement of this typhoon contrasts strongly with those of the atmospheric disturbances of the interior and north of China. Notwithstanding its proximity to Manila and its slow movement this typhoon was almost imperceptible to the inhabitants of that place. On the 14th, when the typhoon was central near N. 15°, the barometer at Manila, which had remained almost stationary during the preceding forty-eight hours, began to rise, and it is probable that its slight oscillations during the forty-eight hours indicated the slow movement of the storm and that its track remained at the same distance from Manila. The east and southeast winds which prevailed at Manila before the passage of the center were very light; after the center had passed the wind changed to southwest, 13 miles per hour. The storm crossed the Gulf of Tonquin without developing much energy, but the ship Fabius, which left Hong-Kong on July 15 for Cochin-China, probably experienced the full force of the typhoon, as she returned to Hong-Kong, dismasted, on the 20th. At noon of the 17th this vessel was in N. 18° 41′, E. 111° 44′, wind blowing from the north with extreme violence, barometer 29.68 (753.9), and falling; at midnight of the 18th the barometer reached its minimum, 29.42 (747.2), and the wind shifted by west to southwest.

Ocean ice.—May 22d: bark Emilie, in N. 43° 42′, W. 48° 36′, passed hundreds of icebergs and a large ice-field extending from ENE. to WSW. 23d: bark Amaranth, in N. 44° 00′, W. 46° 50′, passed three icebergs from 40 to 50 feet high; 24th, from N. 43° 05′, W. 42° 30′, to N. 42° 30′, W. 50° 30′, passed 60 icebergs, some of which were 70 to 90 feet high, and from 400 to 500 feet long; 25th, in N. 42° 00′, W. 51° 20′, passed three icebergs. 27th: steamship Elbe, in N. 41° 51′, W. 48° 39′, passed two icebergs; in N. 41° 46′, W. 50° 37′, passed one iceberg. 28th: ship Saint Nicholas, in N. 42° 40′, W. 40° 00′, was in the ice for twenty-four hours. 29th: ship W. R. Grace, in N. 41° 28′, W. 47° 50′, passed remnant of an iceberg; steamship Lessing, in N. 40° 46′, W. 47° 35′, passed several large icebergs. 30th: steamship Circassian, in N. 47° 35′, W. 57° 05′, passed a number of icebergs. 31st: bark Scotland, in N. 41° 11′, W. 46° 55′ passed a large iceberg; in N. 40° 58′, W. 48° 02′, passed two icebergs. June 1st: steamship Britannic, in N. 42° 40′, W. 50° 38′ and N. 42° 30′, W. 52° 02′, passed several icebergs, some very large; steamship Coventina, in N. 40° 56′, W. 46° 08′, passed an iceberg; steamship England, in N. 41° 44′, W. 47° 34, passed a very large iceberg; steamship Heckla, in N. 42° 29′, W. 53° 08′, passed several icebergs; steamship The Queen, in N. 41° 28′, W. 48° 00′, passed several icebergs; steamship Lepanto, from N. 42° 30′, W. 49° 00′ to N. 42° 30′, W. 53° 00′, passed numerous icebergs. 2d: steamship Coventina, in N. 42° 48′, W. 51° 15′, passed two very large icebergs; steamship Devonia, in N. 43° 40′, W. 46° 53′, passed two small icebergs. 3d: steamship City of Montreal, in N. 41° 16′, W. 47° 27′, passed a large iceberg with several large pieces of ice floating around it; steamship Devonia, in N. 42° 24′, W. 51° 15, passed a large iceberg; in N. 42° 24′, W. 51° 28′, passed one large and two small icebergs; in N. 42° 24′, W. 51° 55′, passed three large icebergs; steamship France, in N. 42° 21′, W. 51° 05′, passed a number of large icebergs; steamship Frisia, in N. 42° 37′, W. 47° 08′, passed an iceberg about 200 feet high; in N. 42° 06′, W. 49° 04′, passed two icebergs; steamship State of Nebraska, from N. 53° 56′?, W. 49° 12′, to N. 43° 37′, W. 50° 50°, passed large numbers of icebergs; bark Scotland, in N. 41° 48′, W. 51° 48′, was surrounded by a great number of large and small icebergs. 4th: steamship Belgenland, in N. 40° 18′, W. 48° 50′, passed a large iceberg; steamship Pollux, in N. 44° 41′, W. 51° 31′, passed several large icebergs. 5th: steamship Adriatic, in N. 42° 10′. W; 48° 30′, passed a small iceberg; in N. 42° 05′, W. 49° 00′, passed an iceberg; steamship Main, in N. 42° 43′, W. 47° 16′, passed an iceberg about 200 feet high; in N. 42° 13′, W. 48° 06′, passed one large and two small icebergs; in N. 41° 56′, W. 50° 03′, passed a small iceberg. 6th: Ship Larnica, in N. 44° 26′, W. 42° 50′, passed an iceberg. 7th: steamship Westphalia, in N. 41° 20′, W. 47° 25′, passed an iceberg. 9th: Bark Petunia, at Saint Johns, Newfoundland, reported having sighted 932 icebergs between N. 44° 00′, W. 43° 20′ and the Cape Race coast; steamship Cassius, in N. 45° 00′, W. 44° 36′, passed several icebergs; steamship Irthington, in N. 41° 50′, W. 48° 16′, passed two large icebergs; ship Larnica, in N. 44° 00′, W. 48° 30′, passed six icebergs; bark Alice M. Claridge, off the Banks of Newfoundland, passed seven icebergs and a quantity of drift ice. 10th: steamship America, in N. 42° 30′, W. 50° 36′, passed through a fleet of icebergs, some of which were 300 feet high; steamship Bohemia, in N. 42° 12′, W. 50° 00′, passed a number of icebergs; steamship Cassius, in N. 42° 35′, W. 48° 30′, passed seven large icebergs from 150 to 300 feet high; steamship Wieland, in N. 42° 46′, W. 46° 22′, passed an iceberg about 50 feet high; bark Heinrich and Antoine, in N. 41° 55′, W. 51° 20′, passed two icebergs. 11th: steamship Alhambra, 20 miles ENE. of Cape Race, met several icebergs; 11th to 13th, steamship Abyssinia, from N. 42° 04′, W. 49° 13′, to N. 42° 37′, W. 52° 57′, passed several icebergs; steamship Istrian, in N. 42° 30′, W. 50° 00′, passed several icebergs and considerable drift ice; steamship Thingvalla, in N. 44° 00′, W. 45° 00′, passed three large icebergs; steamship Wieland, in N. 42° 28′, W. 50° 20′, passed an iceberg; in N. 42° 21′, W. 45° 27′, passed two icebergs. 12th: steamship Edam, in N. 43° 38′, W. 48° 50′, passed a small iceberg; bark Marco Polo, in N. 44°, W. 45°, passed several large icebergs: 13th: steamship Edam, in N. 42° 50′, W. 48° 50′, passed a large iceberg; ship John Harvey, in N. 41° 00′, W. 48° 20′, passed a large iceberg. 15th: steamship Bulgarian, from N. 43°, W. 48° to W. 50°, passed 50 or 60 icebergs, large and small, extending north and south as far as could be observed; bark Quebec, in N. 43° 36′, W. 57° 00′, passed 12 icebergs. 17th: steamship Colina, at Saint John's, Newfoundland, reported numerous icebergs from Cow Bay to Cape Race; steamship Scythia, in N. 43° 18′, W. 48° 05′, passed an iceberg, also, in N. 42° 19′, W. 50° 52′, passed a large iceberg. 18th: bark Sendemanden, at New York, from Trieste, reported a large iceberg in N. 39° 34′, W. 38° 46′. 21st: steamship Ashdrubal struck an iceberg, 20 miles off Cape Race, and sank. 24th: steamship Bothnia, in N. 42° 37′, W. 49° 48′, passed several large icebergs. 25th: steamship Bristol, in N. 43° 15′, W. 49° 10′, passed an iceberg; steamship De Ruyter, in N. 43° 33′, W. 50° 40′, passed a large iceberg.

The following extract of a communication by Mr. E. Douglas Archibald, published in Nature, contains valuable information bearing on the subject of ocean ice: "In view of the recent unusually cold weather in England and Scotland, which has been so well described and proximately explained in last week's Nature, the following paragraph, extracted from the Standard of June 15th, appears to me highly suggestive, especially as regards one of the probable causes for the 'unwonted high pressures' on the northern side of the depression, which is accused of being the immediate source of these unseasonable conditions: 'News from Iceland states that the Spitzbergen floe-ice surrounds the north and east coast, entirely preventing navigation. A Norwegian steamer, endeavoring to reach Bernfiord, on the southeast coast, last week, was caught in the ice and had to put back. Owing to the presence of these immense ice-fields vegetation has made no progress, causing a great loss of horses and sheep through starvation. Epidemics of measles and small-pox have been introduced into the island from Europe, and are making extensive ravages among the population; the former is especially prevalent in Rejkjavik.' Now, it has been ascertained, with some considerable degree of certainty, by Messrs. Blanford and Elliott, the government meteorologists in India, that a heavy winter snowfall over the northwest Himalaya exercises a marked and prolonged influence in lowering the temperature and elevating the atmospheric pressure, and thereby directly affecting the winds and weather over the whole of northern India and parts of central India; and indirectly to a much greater distance. Turning to Europe, we find the distance from Rejkjavik, on the west coast of Iceland, to London is about 1,140 miles, or about the same as from Lahore to Calcutta (1,080 miles), while from Cape Horn, on the east coast of Iceland, to Edinburgh the distance is only 750 miles, or about the same as from Calcutta to Agra. To any one familiar with Indian weather charts or the meteorology of that country, it would appear absurd not to attempt to correlate the meteorological conditions at places so comparatively near as the above-mentioned towns; and, in fact, experience has shown that the meteorology of the Punjab is not only intimately connected with that of lower Bengal, but also with that of southern India. If, therefore, it has been found that an abnormally heavy snowfall in the northwest Himalaya, such as that which characterized the winters of 1876–'77 and 1877–'78, exercised a marked effect on the meteorology of northern India, which was felt at places situated 1,000 miles or more from the seat of action, may it not be reasonably inferred that the presence of a large mass of ice and snow in the Icelandic area would be likely to give rise to similar atmospheric conditions over these islands? It seems, therefore, not at all improbable that the abnormal weather during the past few weeks may be directly due in some considerable measure to the coincident appearance of large masses of ice off the eastern coasts of Iceland, like those which, from the account in the Standard, appear to be at present prevailing to an unusual extent. In the case of India an abnormally heavy fall of snow in the Himalayan zone is found to be associated not only with the subsequent conditions already named, but also with an initially and, therefore, according to experience, subsequently weak, southwest monsoon, which in its turn invariably causes local if not general drought and famine. These heavy snowfalls are found to have a tendency to recur at the minimum sun-spot epochs, and are proximately due to some condition of the upper anti-monsoon current, at present not exactly known, by which a larger amount of vapor is deposited in the winter on the Himalaya as snow and on the North Indian plains as the winter rains. It does not appear that we can so readily account for the occurrence of the present ice-floes off Ireland, or for the large masses which have been encountered this spring in the western Atlantic. They must, however, to some extent be due to the unusually warm winter which seems to have prevailed pretty uniformly over the North Atlantic and Northwest Europe, and which has detached a larger proportion than usual of the Arctic ice-fields. And though it is improbable that we shall find any such regular periodicity in the amount of these ice-floes in the Atlantic as in that of the Indian winter snows and rains, it is worthy of notice to observe that they have a decided tendency to occur to an unwonted extent about the times of maximum sun-spot—like the present. Thus, Professor Fritz, of Zurich, gives the following as the list of years in which floating ice was found most abundantly in the lower latitudes of the North Atlantic:

Years of greatest frequency of floating ice:

	Epochs of maximum sun-spot.
1879	1788.1 1804.2
1816–'18	1816.4
1828–'29–'31	1829.9
1862–'64	1837.2 1858.1 1860.1
1868–'69	1870.6

"It is also interesting to notice that in 1862 Heis's Wochenschrift mentions that the floating ice-masses in the Atlantic caused 'a noticeable cooling of the weather in June over Europe.' And it is further significant to find in a detailed list of the ice met with every month in the Atlantic by ships belonging to the North German lines, from 1860 to 1869, that 1868 and 1869 (the year in which similar weather to the present is mentioned as having been observed by the writer of the paragraph in Nature) were the years in which the greatest quantity of ice was encountered. Though I agree with Dr. Hann in attributing more importance to the tropical than to the polar area in influencing the general weather of these latitudes, I think it very probable on theoretical grounds that we are relatively more influenced by the latter area in summer and by the former in winter, and that, just as it has been inferred that the regular recurrence of periods of diminished temperature in Europe is due to the regular movements of the ice in the polar area, so we may reasonably conclude that abnormal movements of the ice, especially in the Spitzbergen area, are likely to produce periods of abnormal coolness such as that which at present prevails. In any case the moral to be drawn, if we really do intend to solve the weather problem, is by all means to have a meteorological station in Iceland and endeavor to study the weather, as we are fortunately able to do in India, on a large scale, instead of merely confining our attention to the minute range of conditions we are able to observe within the limited area of these islands."

TEMPERATURE OF THE AIR.

The distribution of mean temperature over the United States and Canada for the month of June, 1882, is exhibited by the dotted isothermal lines on Chart II. The table of mean temperatures at the lower left-hand corner on Chart II shows the average temperature which prevailed in each district during the current month, compared with the mean temperature of each district, as determined from observations taken at Signal Service stations during the corresponding month of the past ten years. The temperature has differed slightly from the normal in the districts on the Atlantic coast, the excess being only 0.1 of one degree in the Middle States and 0.2 in New England. In all other districts east of the Rocky Mountains the temperature has ranged from one to two degrees below the normal, except in the Missouri Valley where it is slightly above the normal for the month. On the Pacific coast the temperature was about two degrees below the normal in California, and slightly above in Oregon and Washington Territory. At the station on the summit of Mount Washington it was 1.8 degrees below, and on the summit of Pike's Peak it was 3.4 degrees below the mean for the month.

Deviatións from mean temperature.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of Chart II. The following items of importance, in connection with this subject, are reported by voluntary observers: *Illinois:* Riley, mean temperature 63°.7, or 2°.9 below the mean of past twenty-one years. During that period the only June mean temperature lower than that of the present year occurred in 1869. *Kansas:* Wellington, mean temperature 72°.5, or 3°.2 below the average of past three years. Yates Center, mean temperature 74°.6, or 0°.4 below the average of past two years. *Maine:* Gardiner, mean temperature 61°.94, or 1°.45 below the average of the past forty-six years. *Maryland:* Fallston, mean temperature 70°.36, or 0°.25 below the average of the past eleven years. During that period the highest means, 72°.40, 72°.61, and 72°.17, occurred in 1871, 1874, and 1876 respectively; the lowest, 67°.42, occurred in 1881. *Missouri:* Saint Louis, Missouri Weather Service, mean temperature differs but little from the average of reports past forty years. *New York:* North Volney, mean temperature 62°.82, or 2°.22 below the average of the past thirteen years. During that period the lowest mean temperature, 58°.68, occurred in 1881; the highest, 71°.59, occurred in 1870. Palermo, mean temperature 62°.4, or 1°.9 below the average of the past twenty-nine years. During that period the highest monthly mean, 71°.6, occurred in 1870; the lowest, 59°.3, occurred in 1855. *Vermont:* Woodstock, mean temperature 64°.27, or 0°.78 above the average of the past fifteen years. During that period the highest June mean, 67°.07, occurred in 1876; the lowest, 58°.78, occurred in 1869; the highest maximum temperature, 95°.3, occurred June 30, 1878; lowest minimum, 31°.4, occurred June 7, 1881. *Virginia:* The following records, furnished by Mr. Howard Shriver, of Wytheville, show the mean, maximum, and minimum temperatures for each month for a number of years, with the monthly and annual averages:

Maximum and minimum temperatures.

Year.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
1861	48	25	56	25	63	27	70	38	75	44	80	43	80	61	81	62	73	49	67	44	57	31	56	26
1862	63	29	52	29	56	25	66	35	74	50	74	56					73	59	69	40	63	32	59	20
1866	63	8	62	—3	72	17	81	31	83	40	89	48	96	54	88									
1868			56	—1		10	83	28	81	44	82	48	92	61	82	56	84	36	76	26	68	21	50	—10
1869	50	15	65	14	76	—1	78	28	84	40	90	53	88	52	92	47	82	36	68	25	65	18	53	13
1870	60	6	64	5	60	10	80	36	84	40	86	56	86	57	84	62	80	45	71	34	66	20	60	—4
1871	62	17	60	14	72	28	82	38	84	43	86	59	88	51	89	56	82	37	79	31	68	22	68	—3
1872	59	—6	62	—6	70	10	80	33	82	42	86	56	87	65	87	59	88	42	79	31	57	6	58	0
1873	61	11	62	—3	69	1	81	33	83	46	85	51	86	59	88	52	85	39	74	21	64	2	64	2
1874	64	3	74	20	70	21	74	31	90	44	92	56	80	57	89	56	84	49	74	28	70	17	69	21
1875	60	4	63	5	70	24	75	20	86	40	88	55	88	65	85	58	84	36	75	30	65	21	66	7
1876	70	13	69	8	73	15	78	32	84	37	87	54	90	50	88	56	85	50	77	27	75	23	51	0
1877	65	3	61	18	72	11	78	33	90	38	87	48	91	58	89	57	83	44	80	32	69	12	73	13
1878	54	—4	62	9	74	22	83	31	83	32	85	44	91	54	88	54	81	41	77	22	70	23	52	5
1879	60	—6	65	6	74	20	79	22	84	32	86	45	91	55	87	47	82	32	86	22	83	8	64	10
1880	73	19	73	10	70	24	81	23	86	36	88	42	91	52	89	50	87	36	78	27	70	10	56	—10
1881	47	7	60	6	67	12	80	17	90	43	88	44	96	50	94	51	96	48	86	34	77	10	64	12
1882	65	11	64	12	75	20	79	24	83	32	88	45												
Means	60.2	9.1	62.8	8.9	69.6	16.4	78.2	29.6	83.7	40.2	85.9	50.2	88.8	56.3	87.5	54.9	83.1	42.5	76.0	29.6	67.9	18.5	60.2	3.4

NOTE.—Observations made at or near 7 a. m., 2 p. m., and 9 p. m., until October 1, 1878; subsequently by self-registering instruments.

Mean temperatures.

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Means.
					°	°			°	°	°	°	°
1860	....	....	....	....	65	68	....	....	62	55	43	33	54
1861	57	41	45	52	60	72	67	71	65	55	43	40	54
1862	41	40	41	51	51	68	75	74	67	56	44	37	55
1866	33	34	42	56	50	64	74	....	....	....	....	....	....
1868	....	31	45	49	59	65	74	69	64	53	40	29	53
1869	38	37	40	51	57	68	72	74	61	47	36	34	50
1870	37	35	37	52	61	68	74	72	64	53	41	31	53
1871	36	40	48	55	62	71	71	73	60	55	43	34	54
1872	30	34	37	55	64	69	74	73	64	53	37	30	54
1873	34	37	47	52	61	70	73	71	64	50	38	38	53
1874	37	39	44	50	63	73	72	69	64	53	43	39	54
1875	34	33	44	49	62	69	73	68	61	49	44	41	52
1876	41	40	41	50	62	68	72	72	64	51	43	26	52
1877	33	39	41	52	53	69	74	70	63	55	43	41	53
1878	31	37	49	55	60	64	74	71	62	51	42	28	53
1879	31	31	45	50	62	67	72	67	60	59	44	42	53
1880	44	40	43	54	66	68	72	71	62	53	38	29	53
1881	31	35	37	47	64	68	73	72	70	58	45	39	53
1882	36	42	46	54	58	67	....	....	....	....	....	....	....
Average means	36	37	43	52	61	68	73	71	63	53	42	35	53

It will be seen from the table of mean temperature above that the mean of June for the current year is one degree below the average mean. The table of maximum and minimum temperatures shows that the maximum temperature of June, 1882, has been exceeded but three times during the period covered by the record. *West Virginia:* Helvetia, mean temperature 65°.54, or 0°.23 below the average of the past six years.

Ranges of temperature at Signal Service stations.—Monthly ranges of temperature during the month of June varied from 22° to 65° over the country east of the Rocky Mountains, and from 19° to 67° on the Pacific coast. The smallest ranges are: San Francisco, 19°; San Diego, 20°; Galveston and Key West, 22°; Cedar Keys and Punta Rassa, 23°; Indianola, 24°; Brownsville, Tex., Pensacola, and New Orleans, 25°; Cape May and Fort Macon, 30°; Hatteras and Jacksonville, 31°; New Shoreham, R. I., 32°; Charleston and Mobile, 34°; Fredericksburgh, Charlotte, and Savannah, 35°. The largest are: Campo, Cal., 67°; Fort Supply, Ind. T., 65°; Deer Lodge, Mont., 63°; Cartersville, Mont., 61°; La Mesilla, 60°; Colfax, Wash., Missoula, Mont., and Fort Apache, Ariz., 59°; Prescott, Ariz., and El Paso, Tex., 58°; Tucson, Ariz., Fort Washakie, Wyo., Dodge City, Kans., and Fort Bennett, Dak., 57°; Spokane Falls, Wash., Winnemucca, Nev., Graham, Tex., Concho, Tex., and Fort Stevenson, Dak., 56°; Umatilla, Oreg., Smithville, Dak., and Fort Elliott, Tex., 55°. The greatest daily ranges of temperature varied in the different districts as follows: New England, from 21° at New Shoreham on the 22d, and 22° at Newport on the 16th, to 31° at Boston on the 7th, Provincetown on the 13th, and 32° at Springfield on the 23d; Middle Atlantic States, from 18° at Cape May on the 12th, and 22° at Delaware Breakwater on the 15th, to 34° at Williamsport and 36° at Barnegat on the 25th; South Atlantic States, from 20° at Macon on the 6th and 14th, and 21° at Hatteras on the 21st, to 28° at Augusta on the 27th, and 30° at Kittyhawk on the 15th; Florida Peninsula, from 17° at Cedar Keys on the 13th, to 19° at Key West on the 11th; East Gulf States, from 16° at New Orleans on the 2d, to 27° at Mobile on the 23d, and 28° at Montgomery on the 28th; West Gulf States, from 11° at Galveston on the 3d, and 16° at Indianola on the 23d, to 29° at Denison on the 1st, Shreveport on the 2d, San Antonio on the 18th, and 32° at Fort Smith, Ark., on the 2d; Rio Grande Valley, from 18° at Brownsville on the 24th, to 35° at Eagle Pass on the 18th; Ohio Valley and Tennessee, from 23° at Cincinnati and Champaign on the 6th and Louisville on the 21st, to 30° at Pittsburgh on the 23d; Lower Lake region, from 22° at Erie on the 27th, to 29° at Detroit on the 6th, Rochester on the 22d and Oswego on the 23d; Upper Lake region, from 23° at Grand Haven on the 12th, to 34° at Escanaba on the 6th, and 36° at Marquette on the 16th: Extreme Northwest, from 36° at Moorhead on the 6th, to 41° at Fort Buford on the 7th; Upper Mississippi Valley, from 22° at Keokuk on the 6th and 25th, 24° at Springfield on the 21st, to 34° at Saint Paul and 35° at Dubuque on the 5th; Missouri Valley, from 28° at Springfield and 29° at Omaha on the 6th, to 39° at Fort Bennett and Huron, Dak.; Northern Slope, from 30° at North Platte on the 7th, to 45° at Fort Shaw on the 5th, and Fort

Keogh on the 6th; Middle Slope, from 23° on the summit of Pike's Peak on the 3d, to 37° at Dodge City on the 14th, and 38° at West Las Animas, Colo., on the 21st, 24th, and 28th; Southern Slope, from 31° at Henrietta and 32° at Fort McKavett on the 2d, to 39° at Stockton on the 1st, and 45° at El Paso on the 11th and 21st; Southern Plateau, from 35° at Santa Fé on the 13th, to 52° at Fort Apache on the 15th; Middle Plateau, from 34° at Pioche on the 12th, to 42° at Winnemucca on the 1st; Northern Plateau, from 36° at Dayton on the 4th, to 47° at Missoula on the 4th; North Pacific Coast region, from 33° at Portland on the 1st, to 41° at Roseburgh on the 2d; Middle Pacific Coast region, from 15° at San Francisco on the 21st, to 33° at Sacramento, and 37° at Red Bluff on the 29th; South Pacific Coast region, from 18° at San Diego on the 25th, to 59° at Campo on the 23d.

Table of comparative maximum temperatures for the month of June.

State or Territory.	Maximum for June, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°			°		*Years.*
Alabama	Mobile	100	Montgomery	106	1881	Mount Vernon Barracks	102	1876	34
Arizona	Tucson	108	Maricopa	116	1876	Fort Mojave	119	1876	12
Do	San Carlos	105	Yuma	114	'76, '77	Fort Lowell	116	1876	11
Arkansas	Fort Smith	101	Little Rock	97	1881	Fort Smith	99		21
Do	Little Rock	98							
California	Red Bluff	102	Visalia	109	1879	Fort Miller	121	1853	13
Do			Red Bluff	105	1878	Fort Yuma	117	1859	31
Colorado	West Las Animas	100	Denver	99	1873	Fort Lyon	107		21
Do	Pike's Peak	47				Fort Lewis	106	1880	2
Connecticut	New Haven	91	New Haven	92	1880	New Haven	102	1864	87
Dakota	Fort Sully	95	Fort Sully	111	'74, '76	Fort Sully	108		15
Do			Fort Meade	103	1881	Fort Buford	106	'68, '70	14
Delaware	Delaware Breakwater	88	Delaware Breakwater	87	1880	Fort Delaware	97		45
District of Columbia	Washington	95	Washington	102.5	1874	Washington	99		49
Florida	Jacksonville	96	Jacksonville	100	1880	Fort King	106	1833?	10
Do						Houston	104	1880	3
Do						Fort Barrancas	104	1854	57
Georgia	Augusta and Savannah	97	Augusta	102	1881	Forsyth	104	1881	7
Do						Oglethorpe Barracks	102	1845	40
Do						Savannah	102	'39, '45	38
Idaho	Lewiston	96	Fort Lapwai	97	1881	Fort Boise	107	1876	15
Do						Fort Lapwai	105		16
Illinois	Springfield	93	Chicago	98	1872	Chicago	102		38
Do						Rock Island Arsenal	102	'70, '78?	12
Indiana	Indianapolis	94	Indianapolis	96	1874	Vevay	100	'65, '66?	13
Do						Richmond	100	1878	2
Indian Territory	Fort Supply	103	Fort Sill	105	'79, '81	Fort Gibson	103		48
Do						Fort Sill	103		9
Do						Fort Supply	105	1875	1
Iowa	Des Moines and Keokuk	92	Dubuque	98	1874	Guttenberg	103	1870	11
Do			Des Moines	96	1881				
Kansas	Dodge City	100	Dodge City	102	1880	Fort Wallace	108	1879	7
Do						Fort Hays	106		10
Do						Holton	106		9
Kentucky	Louisville	95	Louisville	100	1874	Newport Barracks	96		28
Do						Bowling Green	96	1881	2
Louisiana	Shreveport	101	Shreveport	104	1875	Point Pleasant	101	1881	6
Do						Baton Rouge	98		57

Table of comparative maximum temperatures for the month of June—Continued.

State or Territory.	Maximum for June, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station.	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year.	Length of record.
		°		°			°		*Years.*
Maine	Portland	93	Portland	99	1876	Brunswick	98	1808?	53
Do						Hancock Barracks	98	1836?	17
Maryland	Baltimore	97	Baltimore	97.5	1874	Fort Washington	105	1853?	38
Massachusetts	Boston	94	Boston	98	1874	Fort Independence	99	'54, '72?	47
Michigan	Port Huron	88	Alpena	97	1874	Marquette	101	1862?	8
Do						Monroe	101	1866?	10
Minnesota	Saint Paul	88	Breckenridge	96	1876	Saint Paul	99	1870	7
Mississippi	Vicksburgh	99	Vicksburgh	101	1881	Brookhaven	100	1875	5
Do						Fayette	99	1881	7
Missouri	Springfield	98	Saint Louis	99	1881	Allenton	101	1868?	4
Do						Jefferson Barracks	100	1860?	26
Do						Saint Louis	100		39
Montana	Fort Keogh	96	Fort Keogh	104	1881	Fort Benton	104	1870?	10
Nebraska	Omaha	93	North Platte	101	1876	Fort McPherson	108	1876	13
Do						Lincoln	108	1881	1
Nevada	Winnemucca	92	Winnemucca	95	1881	Camp Halleck	107	1871	15
New Hampshire	Mount Washington	63	Mount Washington	71	1878	Dunbarton	100	1876	5
Do						Fort Constitution	96	'50, '52	34
New Jersey	Little Egg Harbor	96	Sandy Hook	97	1874	Atco	102	1875	7
Do						Rio Grande	102	1875	1
New Mexico	La Mesilla	105	La Mesilla	108	1881	Fort McRae	120	1873	11
Do						Albuquerque	114	1857	18
New York	New York City and Oswego.	91	Oswego	98	1875	Fort Hamilton	106	1825	39
Do						Newburgh	102	1849?	47
North Carolina	Charlotte	97	Wilmington	100	1880	Weldon	103	1880	7
Do						Goldsborough	102	1876	4
Do						Fort Johnson	99		57
Ohio	Cincinnati	96	Cincinnati	98	1874	College Hill	100	1881	64
Do						Ruggles	100	1879	7
Oregon	Umatilla	101	Umatilla	103	'78, '80	Fort Dalles	104	1853?	15
Do						Fort Haskins	102	1860?	8
Pennsylvania	Pitsburgh	97	Pittsburgh	98	1874	Carlisle Barracks	100	1868?	37
Do						Mount Joy	100	1869?	10
Rhode Island	Newport	86	Newport	89	1876	Providence	97	1866?	35
South Carolina	Charleston	97	Charleston	100	'77, '80	Aiken	102	1881	4
Do						Charleston	96		105
Tennessee	Memphis	98	Memphis	100	1881	Humboldt	104	'71, '74	4

Do						Castalian Springs	100	1875	2
Texas	Eagle Pass and El Paso	110	Fort Davis	111	1881	Fort Ringgold	114	1877	32
Do			El Paso	109	1881	Fort Duncan	112	1860	31
Utah	Salt Lake City	91	Salt Lake City	94	1874, '76, '79	Mount Carmel	107	1876	3
Do						Fort Crittenden	103	1859	8
Vermont	Burlington		Burlington	94	1878	Lunenburgh	98		16
Virginia	Norfolk	96	Norfolk	102	1874	Accotink	98	1881	7
Do						Fortress Monroe	97		56
Washington Territory	Spokane Falls	94	Dayton	97	1880	Fort Walla Walla	106	1876	12
Do						Fort Vancouver	98		19
West Virginia	Morgantown	85	Morgantown	93	1874	Weston	94	1875	2
Do						Helvetia	89	1880	5
Wisconsin	Madison	87	La Crosse	98	1874	Fort Howard	100		30
Do						Milwaukee	100	1870	11
Wyoming	Fort Washakie	90	Cheyenne	97	'80, '81	Fort Fred Steele	104	1871	

Frosts.—Frosts occurred in the various States and Territories as follows: *California:* Campo, 5th, 21st, 23d; San Gorgonio, 13th, 14th, 21st; *Colorado:* On summit of Pike's Peak, 2d, 3d, 8th, 9th, 10th, 11th, 14th; *Dakota:* Fort Bennett, 4th; Alexandria, 3d, 5th; *Illinois:* Chicago, 1st; Riley, 1st, 5th; *Iowa:* Cresco and Monticello, 5th; Muscatine, 1st, 5th; Nora Springs, 19th; Dubuque, 1st; *Kentucky:* Bowling Green, 4th; *Michigan:* Lansing, 5th; Detroit, 6th; Marquette, 10th, 11th, 20th; *Minnesota:* Moorhead, 4th; *Montana:* Fort Ellis, 20th; *Nebraska:* North Platte, 3d, 4th, 5th; *Nevada:* Carson City, 7th, 21st, 22d; *New Hampshire:* Mount Washington, 1st, 2d, 3d, 5th, 6th, 20th, 29th; *New York:* Friendship and Palermo, 2d, 12th; *New Mexico:* Santa Fé, 13th; *Ohio:* North Lewisburg, 2d; Westerville, 20th; *Pennsylvania:* Meadville, 6th; Dyberry, 12th, 22d; *Rhode Island:* Newport, 2d; *Utah:* Coalville, 22d; *Vermont:* Burlington, 2d, 12th; Woodstock, 12th, 30th; *Wisconsin:* Milwaukee, 1st, slightly damaging tender plants; La Crosse, 5th; Embarras, 1st, 11th; *Wyoming:* Fort Washakie, 22d.

Table of maximum and minimum temperatures for June, 1882.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Alabama	Mobile	100		State line	105	
Do	Montgomery		61	Calera		43
Arizona	Tucson	108		Texas Hill	111	
Do	San Carlos	105				
Do	Fort Apache and Prescott.		36			
Arkansas	Fort Smith	101	50	Madison	103	35
Do	Little Rock	98	55	Arkansas City, Prescott, and Walnut Ridge.	103	
California	Red Bluff	102		Borden		
Do	Campo		31	Mammoth Tank	112	
Colorado	West Las Animas	100	46	Fort Lyon	100	
Do	Pike's Peak	47	2	Fort Garland		30
Connecticut	New Haven	91	46	Southington	95	52
Dakota	Fort Sully	95		Morriston	98	
Do	Fort Stevenson		33			
Delaware	Del. Breakwater	88	50			
District of Columbia	Washington	95	51			
Florida	Jacksonville	96	65	Live Oak	100	
Do				Fernandina and Waldo.		62
Georgia	Augusta			Smithville	114?	
Do	Savannah	97		Way Cross	103	
Do	Atlanta		56	Madison		43
Idaho	Lewiston	96				
Do	Eagle Rock		34			
Illinois	Springfield	93		Charleston and Peoria.	97	
Do	Chicago		42	Riley		39
Indiana	Indianapolis	94	45	Laconia	98	
Do				La Fayette		42
Indian Territory	Fort Supply	103	38			
Iowa	Des Moines			Ames	98	
Do	Keokuk	92		Clinton		33
Do	Dubuque		41			
Kansas	Dodge City	100	43	Manhattan & Yates Center.		40
Kentucky	Louisville	95	50	Bowling Green	97	52
Louisiana	Shreveport	101	59	Vermillionville	107	
Do				Franklin		38
Maine	Portland	93				
Do	Eastport		42			
Maryland	Baltimore	97	53	Emmitsburgh		45
Massachusetts	Boston	94		Somerset	96	
Do	Provincetown		46	Heath		40
Michigan	Port Huron	88		Niles	91	
Do	Escanaba		37			
Minnesota	Saint Paul	88				
Do	Moorhead		35			
Mississippi	Vicksburgh	99	57	Hernando	106	
Do				Okolona		44
Missouri	Springfield	98	46	Sedalia	98	42
Do				Oregon		28?
Montana	Fort Keogh	96				
Do	Deer Lodge and Missoula.		32			

Table of maximum and minimum temperatures for June, 1882—Continued.

State or Territory.	Signal Service.			United States Army post surgeons or voluntary observers.		
	Station.	Max.	Min.	Station.	Max.	Min.
		°	°		°	°
Nebraska	Omaha	93		Fremont	95	
Do	North Platte		38			
Nevada	Winnemucca	92	36	Humboldt	99	
Do				Boca		28
New Hampshire	Mount Washington	63	21	New Market	92	42
New Jersey	Little Egg Harbor	96		New Brunswick	96	
Do	Atlantic City		50	Vineland		50
New Mexico	La Mesilla	105		Fort Union		32
Do	Santa Fé and Silver City.		42			
New York	New York City and Oswego.	91		West Point	97	
Do	Rochester		44	Factoryville & Madison Barracks.		41
North Carolina	Charlotte	97				
Do	Smithville		54			
Ohio	Cincinnati	96		Westerville		40
Do	Cleveland and Toledo.		46			
Oregon	Umatilla	101				
Do	Roseburgh		44			
Pennsylvania	Pittsburgh	97		Dyberry		36
Do	Erie		45			
Rhode Island	Newport	86		Fort Adams	93	45
Do	Narragansett Pier		44			
South Carolina	Charleston	97	63	Hardeville, King's Tree, Georges & Cheraw.	100	
Do				Allendale		38
Tennessee	Memphis	98		Milan	103	
Do	Knoxville and Nashville.		50	Corinth		39
Texas	Eagle Pass and El Paso.	110				
Do	Fort Elliott		44			
Utah	Salt Lake City	91	46	Fort Douglas	93	44
Vermont	Burlington			Woodstock	93	38
Virginia	Norfolk	96		Johnsontown	98	
Do	Chincoteague		50	Snowville & Wytheville.		45
Washington Territory	Spokane Falls	94	39			
West Virginia	Morgantown	85	45	Helvetia	86	42
Wisconsin	Madison	87		Beloit	92	41
Do	Milwaukee		40	Franklin		41
Wyoming	Fort Washakie	90	33	Fort Bridger		20

PRECIPITATION.

The distribution of rainfall in the United States and Canada during the month of June, as determined from observations taken at more than 600 stations, is exhibited on Chart III. The table at the lower left-hand corner of the chart shows the average rainfall of June in each district, as determined from Signal Service observations during the past ten years, and the actual rainfall during the current month, with excess or deficiency as compared with the average.

There has been a deficiency of rainfall in the Gulf States, the Middle and New England States; the greatest deficiency being in the Gulf States, where it ranged from 1.55 to 1.90 inches. In the northwest and Lake region, and in the States north of the Ohio River, there has been an excess of rainfall, the region of greatest precipitation being in the States of the Upper Mississippi Valley. On the Pacific coast the rainfall has been slightly below the average for the month, except in southern California, where it has been slightly in excess, although the average rainfall in that section was less than 0.2 of an inch.

Deviations from average precipitation.—Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative monthly rainfalls (as published in the lower left-hand corner of Chart III). The following items of importance in connection with this subject are reported by voluntary observers: *Illinois:* Riley, monthly rainfall 4.42 inches, or 0.32 inch more than the June average of the past twenty-one years. *Iowa:* Clinton, monthly rainfall 9.05 inches, or about 2.50 inches more than the June average. *Kansas:* Yates Center, monthly rainfall 8.24, or 4.42 inches more than the average of the past two years. Total precipitation for six months ending June 30 is 7.13 inches more than the average of the corresponding period for the past two years. Wellington, monthly rainfall 3.62 inches, or 0.78 inch below the average of past three years. *Maine:* Gardiner, monthly rainfall 4.25 inches, or 1.02 inches more than the June average of the past forty-six years. *Maryland:* Fallston, monthly rainfall 2.32 inches, or 1.43 inches less than the June average of the past eleven years. During that period the largest June rainfall, 7.86 inches, occurred in 1881; the smallest, 1.05 inches, occurred in 1873. *Missouri:* Saint Louis, Missouri Weather Service reports: "The monthly rainfall was greatest in the northeastern and least in the southwestern counties. At Saint Louis the monthly rainfall was a little more than two-thirds of the average June rainfall." *New York:* North Volney monthly rainfall 3.33 inches, or 0.18 inch more than the June average for the past nine years. Palermo, monthly rainfall 2.90 inches. The largest June rainfall that has occurred since 1859, 8.80 inches, occurred in 1865; the smallest, 0.70 inch, occurred in 1864 and 1870. Hector, amount of rainfall for the year ending June 30, 1882, is 23.57 inches. *Virginia:* The following record furnished by Mr. Howard Shriver, of Wytheville, shows the monthly and annual precipitations, with the monthly averages for a number of years:

Year.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
1860	3.1	3.6	3.3	3.6	3.4	3.1	4.1	3.7	2.6	9.4	4.3	4.4	47.0
1861	6.3	5.3	2.3	3.6	3.6	3.2	8.1	3.1	5.3	5.8	4.3	0.2	51.1
1862	4.6	8.0	4.0	6.5	3.2	5.9	4.6	3.2	0.3	2.8	0.5	1.1	44.7
1868	3.1	1.7	2.3	3.3	3.8	2.5	6.6	3.4	4.3	2.6	1.3	3.2	38.2
1869	2.2	2.8	3.2	1.9	4.4	2.0	2.8	2.6	4.2	2.7	1.6	4.1	34.4
1870	2.3	3.0	4.3	2.8	2.3	5.5	2.5	7.6	1.3	2.8	1.5	1.4	37.6
1871	2.3	2.8	4.0	3.3	4.7	3.2	1.7	3.4	3.4	1.7	1.6	6.0	38.1
1872	1.5	2.1	3.3	4.0	5.7	4.9	2.3	2.5	2.4	1.7	1.5	2.9	34.8
1873	3.8	5.4	3.0	3.4	7.3	2.8	2.2	5.3	2.5	2.2	2.5	3.1	43.5
1874	2.7	3.9	2.7	6.2	1.1	3.8	5.6	2.7	5.7	1.1	3.2	1.2	39.9
1875	3.1	4.0	6.5	4.0	0.5	9.1	7.8	4.6	2.4	0.5	3.8	2.7	49.0
1876	2.1	3.0	2.0	0.8	3.4	4.0	2.7	2.6	4.5	1.9	5.4	1.0	33.1
1877	4.0	0.3	5.7	5.4	3.0	4.0	4.1	1.9	3.3	3.9	7.1	4.1	46.8
1878	5.7	2.7	3.2	4.3	5.0	2.9	6.4	3.8	8.3	3.2	3.8	3.2	52.5
1879	4.4	2.4	1.5	2.6	5.1	2.0	2.8	4.5	1.8	5.2	1.1	5.4	38.9
1880	1.8	2.6	5.6	3.9	2.3	2.4	4.4	4.8	3.7	1.8	3.4	2.4	39.1
1881	2.3	3.2	2.0	2.3	0.9	3.4	4.1	2.0	5.7	3.4	2.6	4.1	36.1
1882	7.1	5.1	3.2	2.8	4.5	5.6	....	....	....	....	....	....	....
Means	3.47	3.44	3.45	3.59	3.57	3.92	4.28	3.63	3.63	3.10	2.91	2.97	41.46

West Virginia: Helvetia, monthly rainfall 8.27, or 2.65 inches more than the June average of the past six years.

Table of special heavy, largest, and smallest monthly rainfalls.

Station.	Special heavy.			Largest monthly.	Smallest monthly.	
	Date.	Amt.	Duration.	Amount, inches.	Station.	Amt.
ALABAMA.					ALABAMA.	
		Inch.				*Inch.*
Mount Vernon Barracks	21	2.00	2 hrs.	....	Talladega	0.10
Birmingham	19	6.00	....	14.41	Calera	0.13
ARKANSAS.					ARIZONA.	
Madison	19	3.08	....	....	Mammoth Tank	0.00
					Maricopa	0.09
CANADA.					Texas Hill	0.00
					Yuma	0.05
Chatham, N. B.	....	....	....	6.77	San Simon	0.21
Charlottetown, P. E. I.	....	....	....	6.15	Prescott	0.47
CONNECTICUT.					ARKANSAS.	
New London	24	1.69	1 hr. 30 m.	....	Brinkley	0.06

Table of special heavy, largest, and smallest monthly rainfalls—Continued.

Station.	Special heavy.			Largest monthly.	Smallest monthly.	
	Date.	Amt.	Duration.	Amount, inches.	Station.	Amt.
DAKOTA.					CALIFORNIA.	
Smithville	26	2.53		9.59	Presidio	0.00
Fort Sisseton				7.42	Oakland	0.00
Olivet				6.69	Pleasanton	0.00
Fort Stevenson				6.07	Livermore	0.00
					Tracy	0.00
FLORIDA.					Lathrop	0.00
					Stockton	0.00
Cedar Keys				9.56	Galt	0.00
Punta Rassa	11	6.31		8.46	Summit	0.00
Waldo				8.43	Chico	0.00
Fort Barrancas	8 and 9	2.64	19 hrs.		Redding	0.00
Key West	11	2.26	3 hrs. 40 m.		Turlock	0.00
Pensacola	28	1.48	30 min.		Merced	0.00
					Borden	0.00
GEORGIA.					Fresno	0.00
					Kingsburgh	0.00
Way Cross				10.63	Martinez	0.00
Savannah	29 and 30	3.53		7.95	Byron	0.00
Tocoa	25	2.85		7.86	South Valejo	0.00
Macon				7.76	Suisun	0.00
Griffin				7.08	Davis	0.00
Madison				6.52	Napa	0.00
Atlanta	15	1.45	1 hr. 10 m.		Calistoga	0.00
					Woodland	0.00
ILLINOIS.					Goshen	0.00
					Tulare	0.00
Springfield	2	2.51		12.71	Delano	0.00
Peoria				11.18	Mojave	0.00
Morrison				10.06	Newhall	0.00
Champaign				9.93	San Fernando	0.00
Charleston				7.70	Spadra	0.00
Elmira				6.23	Whitewater	0.00
Rockford	24	1.40	1 hr.		Indio	0.00
					Anaheim	0.00
INDIANA.					Petaluma	0.00
					Point San José	t'ce
Indianapolis	16	1.40	30 m.	9.35	Niles	t'ce
Lafayette				9.10	Antioch	t'ce
Logansport	13	3.45	1 hr. 45 m.	8.89	Lemoore	t'ce
Saint Meinrad				6.75	Los Angeles	t'ce
Vevay				6.53	Benicia Barracks	0.02
New Corydon				6.17	San Francisco	0.04
					Ione	0.04
INDIAN TERRITORY.					Sumner	0.05
					San Diego	0.07
Fort Supply	12	3.10			Poway	0.09
					Alcatraz Island	0.10
IOWA.					Keene	0.10
					Sacramento	0.10
Des Moines	10	3.51		12.16	Tuohey's Ranche	0.10
Do	28	2.76			Dunnigan	0.12
Keokuk				9.75	Colfax	0.13
Logan	11	3.30		9.60	Farmington	0.13
Do	29	3.10			Red Bluff	0.15
Clinton				9.05	Tehachapi	0.15
Fort Madison				8.75	Knight's Landing	0.16
Davenport				8.43	Williams	0.17
Muscatine				8.25	Modesto	0.19
Ames				7.43	Salinas City	0.19
Dubuque				6.29	Ravenna	0.25
Cresco	24	2.50	9 hrs.	6.10	Rocklin	0.25
Nora Springs	24	1.50	1 hr.		Campo	0.26
Le Claire	25	4.25			Willows	0.27
					Auburn	0.28
KANSAS.					Fort Gaston	0.28
					Tehama	0.28
Yates Center	14 and 15	2.54	14 hrs.	8.24	Brighton	0.31
					Fort Bidwell	0.38
MAINE.					Cisco	0.45
					Colton	0.50
Eastport				6.53		
					GEORGIA.	
MARYLAND.						
					Gainesville	0.21
Sandy Springs	19	1.07	30 m.			
					IDAHO.	
MASSACHUSETTS.						
					Cœur d' Alene	0.16
Springfield	4	1.88	2 hrs.		Lewiston	0.36

Table of special heavy, largest, and smallest monthly rainfalls—Continued.

Station.	Special heavy.			Largest monthly.
	Date.	Amt.	Duration.	Amount, inches.
MICHIGAN.				
Northport	3 and 4	3.15	21 hrs.	13.50
Do	14	2.60	4 hrs. 50 m.	
Do	18	2.40	1 hr. 50 m.	
Do	30	2.80		
Battle Creek	25	3.00	1 hr.	8.00
Hastings				6.90
Alpena				6.66
Port Huron				6.34
Thornville	14	2.35	13 hrs.	6.22
Escanaba				6.15
Grand Haven				6.05
Coldwater	25	2.00	2 hrs. 15 m.	
MINNESOTA.				
Duluth	17 and 18	2.54		6.72
MISSISSIPPI.				
Meridian	22	3.01		6.76
Lake	16	3.00		
MISSOURI.				
Protem	11	1.30	50 min.	7.14
NEBRASKA.				
Fremont				7.61
De Soto				7.31
Omaha	25	3.38	3 hrs. 10 m.	
NEW HAMPSHIRE.				
Mount Washington	1	2.80		11.40
NEW JERSEY.				
Paterson				9.00
NEW YORK.				
Troy				8.64
NORTH CAROLINA.				
New River Inlet				6.27
Murphy				6.05
Kitty Hawk	15	1.00	40 min.	
OHIO.				
College Hill				9.75
PENNSYLVANIA.				
Franklin				7.88
Pittsburgh	16	1.44	1 hr. 15 m	
SOUTH CAROLINA.				
Charleston	18	3.25	3 hrs. 35 m.	9.12
Jacksonborough				6.44
TENNESSEE.				
Corinth	19	2.94		
TEXAS.				
Galveston	6 and 7	5.62		6.16
Concho	13	1.47	1 hr. 40 m.	
VERMONT.				
Newport				6.49

Smallest monthly.	
Station.	Amt.
MISSISSIPPI.	
Okolona	0.31
Vicksburgh	0.40
Grenada	0.50
NEVADA.	
Boca	0.00
Wadsworth	0.00
Beowawee	0.10
Toano	0.10
Tecoma	0.15
Carlin	0.20
Elko	0.20
Reno	0.20
Wells	0.25
Halleck	0.27
Fort McDermitt	0.28
Otega	0.37
Humboldt	0.49
NEW MEXICO.	
Deming	0.43
OREGON.	
Umatilla	0.17
Albany	0.41
TEXAS.	
Austin	0.00
Orange	0.00
Longview	0.02
Tyler	0.09
San Antonio	0.11
Belton	0.16
Luling	0.27
Fredericksburgh	0.30
Beaumont	0.35
Uvalde	0.36
College Station	0.40
Hearne	0.42
Waco	0.50
UTAH.	
Kelton	0.00
Terrace	0.00
WASHINGTON.	
Almota	0.01
Colfax	0.12
Pomeroy	0.27

Table of special heavy, largest, and smallest monthly rainfalls—Continued.

Station.	Special heavy.			Largest monthly.	Smallest monthly.	
	Date.	Amt.	Duration.	Amount, inches.	Station.	Amt.
VIRGINIA.						
Fort Monroe	16	2.84	4 hrs.			
WEST VIRGINIA.						
Helvetia				8.27		
WISCONSIN.						
Madison				7.76		
Beloit				6.51		
Embarras				6.40		

The following table shows the least and greatest numbers of rainy and cloudy days and percentages of mean relative humidity as reported from the various districts during the month:

Table of rainy and cloudy days and relative humidity for June, 1882.

Districts.	Rainy days.	Cloudy days.	Relative humidity.
			Percentages.
New England	From 9 to 17	From 2 to 11	From 62.1 to 82.2
Middle Atlantic States	From 7 to 22	From 1 to 12	From 58.6 to 80.6
South Atlantic States	From 9 to 18	From 1 to 8	From 60.6 to 80.1
Florida Peninsula	From 9 to 14	From 2 to 9	From 68.3 to 75.8
East Gulf States	From 4 to 15	From 1 to 6	From 62.8 to 78.6
West Gulf States	From 3 to 8	From 1 to 4	From 67.1 to 79.6
Rio Grande Valley	From 2 to 7	From 2 to 7	From 60.6 to 81.1
Ohio Valley and Tennessee	From 12 to 22	From 1 to 14	From 65.0 to 75.2
Lower Lake region	From 13 to 19	From 4 to 11	From 65.1 to 70.6
Upper Lake region	From 10 to 20	From 8 to 10	From 62.6 to 77.8
Extreme Northwest	From 9 to 17	From 4 to 10	From 67.5 to 78.5
Upper Mississippi Valley	From 12 to 23	From 9 to 18	From 58.8 to 82.0
Missouri Valley	From 11 to 20	From 3 to 14	From 67.0 to 74.6
Northern Slope	From 6 to 17	From 2 to 11	From 57.1 to 74.8
Middle Slope	From 4 to 18	From 4 to 7	From 55.0 to 81.7
Southern Slope	From 4 to 10	From 1 to 5	From 37.0 to 63.8
Southern Plateau	From 8 to 11	From 1 to 6	From 35.4 to 49.8
Middle Plateau	From 8 to 9	From 3 to 7	From 39.1 to 42.2
Northern Plateau	From 4 to 14	From 0 to 9	From 44.8 to 63.8
North Pacific Coast region	From 8 to 11	From 7 to 11	From 62.1 to 71.7
Middle Pacific Coast region	From 1 to 4	From 0 to 6	From 41.0 to 78.5
South Pacific Coast region	From 1 to 3	From 1 to 9	From 37.5 to 71.0

Snow.—Snow has been reported by the following stations: Lansing, Mich., 4th; Wytheville, Va., 5th, light, spitting snow, lasting a few minutes; Milwaukee, 3d; Pike's Peak, 2d, 3d, 4th, 5th, 7th, 8th, 10th, 12th, 13th, 15th; Mount Washington, 2d, 3d, 5th; Burlington, Vt., 1st, summits of mountains covered with snow; 12th, 20th, and 21st, summit of Mount Marcy covered with snow.

Hail.—Kittyhawk, N. C., 28th: Severe hail-storm, doing great damage to crops in this locality; hailstones as large as walnuts. Laredo, Tex., 8th: Severe hail-storm from 6.20 to 7.25 p. m.; all windows of northern exposure were broken; hailstones of enormous size fell (some of them weighing one pound), and drifted in places to a depth of six inches. Great damage was done by the breaking of skylights in stores, exposing goods to the violence of the storm. Dubuque, Iowa, 16th: For thirteen minutes, commencing at 2.54 p. m., the largest and most destructive hailstones fell that were ever seen at this place. The hailstones measured from one to 17 inches in circumference, the largest weighing one pound and twelve ounces. Washington park was literally covered with hailstones as large as lemons, and large basketfuls could be gathered in a few minutes. They exhibited diverse and peculiar formations, some being covered with knobs and icicles half an inch in length; others were surrounded by rings of different colored ice with gravel and blades of grass imbedded within them. The foreman of the Novelty

Iron Works, of this city, states that in two large hailstones melted by him were found small living frogs. A number of persons were severely cut and bruised by the falling hailstones. The damage inflicted is estimated at $5,000. One florist lost 2,387 panes of glass. Hundreds of windows of south and west exposure were broken, including twenty windows of heavy French plate glass. Railroad men report that hail fell at 2 p. m. at McGregor, forty miles northwest. No hail fell on the eastern side of the Mississippi, or at Julien, six miles west of this city. Cairo, Ill., 27th: During the violent storm, a description of which will be found elsewhere in the Review under the head of local storms, considerable large hail fell along the center of the storm north of this station. La Crosse, Wis., 27th: Large quantities of hail fell along the track of the tornado (see local storms) of this date. Omaha, 25th: Hailstones measuring one eighth of an inch in diameter fell for twenty-five minutes during storm. Huron, Dak., 23d: Storm accompanied by destructive hail. Helena, Mont., 8th: During storm hailstones fell measuring one inch in diameter. West Las Animas, Colo., 11th: Heavy shower of hail lasting thirty minutes; hailstones measuring three-eighths of an inch in diameter fell, breaking much window glass. Morrison, Ill., 16th: Destructive hail-storm reported to have occurred near Lyndon in this State. Anna, Ill., 18th: Severe hail-storm; hailstones three-fourths of an inch in diameter, breaking much glass. Worcester, Mass., 4th: A heavy hail-storm occurred a few miles north of this city. Thornville, Mich., 8th: Considerable damage done to corn and wheat fields and gardens by hail; the track of the storm was about one mile in width; on the 18th a hail-storm occurred in the township of Goodland in this State; several wheat fields were entirely destroyed; hailstones fell weighing two ounces. Protem, Mo., 11th: Hail-storm causing great damage to the wheat crop and fruit; the hailstones were about two-thirds as large as hen's eggs, and were of irregular shapes. Freehold, N. J., 4th: Destructive hail-storm occurred between 9.20 and 10.15 p. m. over a strip of country lying to the east of this place; the path of the storm was about thirty miles in length and half a mile in width. 25th: Severe storm accompanied by hail, consisting mostly of jagged and broken ice; some specimens measuring one and three-eighths inches in length and half an inch in thickness. Weldon, N. C., 4th: During severe storm hailstones as large as hen's eggs fell. Fallsington, Pa., 25th: Hail-storm at 5 p. m., during which the temperature fell 16° in a few minutes; some of the hailstones were an inch and a half in length and of irregular shapes. Sydney, Nebr., 14th: Heavy storm accompanied by hail of remarkable size destroying much window glass.

Hail-storms of less violence have occurred in the various States and Territories as follows: *Arizona:* Yuma, 18th; *Colorado:* Fort Lewis, 12th; *Dakota:* Fort Meade, 12th; Bismarck, 12th, 30th; Rapid City, 15th; Fort Hale, 17th; Fort Stevenson, 21st; Wicklow, 24th; *Georgia:* Atlanta, 17th; Augusta, 18th; Savannah, 29th; *Illinois:* Swanwick, 21st; Rockford, 24th; *Indiana:* Saint Meinrad, 26th; *Iowa:* Clinton, 16th; Guttenberg, 16th, 24th; Nora Springs, 17th, 21st; Burlington, 18th; Des Moines and Independence, 22d; *Kansas:* Yates Center, 14th, 15th; *Maine:* Gardiner, 9th; *Maryland:* Baltimore, 19th; *Massachusetts:* Worcester, 4th; Boston, 5th; *Michigan:* Thornville, 8th; Port Huron, 14th, 18th; Litchfield, 15th; *Missouri:* Protem, 2d, 15th; *Montana:* New Chicago, 9th; Terry's Landing, 20th, 28th; Fort Shaw, 23d; Forts Custer and Ellis, 28th; *Nebraska:* Fremont, 17th; Fort Niobrara, 20th; Genoa, 23d; *Nevada:* Winnemucca, 9th; Fort McDermitt, 11th; Carson City, 14th; Pioche, 28th; *New Hampshire:* Grafton, 19th; *New Jersey:* Freehold, 4th, 25th; Readington, 15th; Cape May, 19th; Paterson, 20th; *New York:* North Volney, 2d, 15th; Palermo, 2d; Troy, 4th; Oswego and Rochester, 19th; *Ohio:* Cleveland, 4th; Cincinnati, 16th; *Oregon:* Portland and Umatilla, 18th; *Pennsylvania:* Dyberry, 6th, 17th; *South Carolina:* Charleston, 15th; *Tennessee:* Memphis, 12th; Chattanooga, 17th; Murfreesborough, 18th; Nashville, 22d; Knoxville, 28th; *Texas:* Henrietta, 2d, Laredo, 8th; Eagle Pass, 13th; *Vermont:* Lunenburgh, 9th; *Washington Territory:* Dayton and Spangle, 20th; *West Viryinia:* Morgantown, 19th.

Sleet.—Sleet was reported as follows: On summit of Mount Washington, 2d; Pike's Peak, 1st, 2d, 3d, 7th to 11th, 18th, 19th, 27th.

COTTON-REGION REPORTS.

The following table gives the average rainfall, mean of maximum and mean of minimum temperatures in each of the cotton districts as shown on Chart VI, issued with the April Review:

Meteorological record for the cotton districts for the month of June, 1882.

Districts.	Average rainfall.	Mean of maximum.	Mean of minimum.
	Inches.		
New Orleans	2.43	90.6	72.5
Savannah	4.97	89.9	70.4
Charleston	4.98	89.9	67.5
Atlanta	3.85	88.6	66.8
Wilmington	1.97	90.0	66.2
Memphis	2.89	90.4	67.0
Galveston	0.90	92.7	70.0
Vicksburgh	1.44	91.2	68.5
Montgomery	3.49	91.5	69.4
Augusta	4.06	90.5	67.5
Little Rock	1.58	91.8	64.2
Mobile	2.60	94.8	68.8

Meteorological record for the cotton districts for the month of May, 1882.

Districts.	Average rainfall.	Mean of maximum.	Mean of minimum.
	Inches.		
New Orleans	5.57	84.4	61.1
Savannah	2.59	84.8	60.7
Charleston	2.58	81.9	58.1
Atlanta	2.39	78.9	56.2
Wilmington	2.52	79.0	54.6
Memphis	7.58	77.7	56.8
Galveston	5.25	83.9	59.9
Vicksburgh	7.03	81.9	60.8
Montgomery	3.02	81.9	58.2
Augusta	2.11	82.2	57.8
Little Rock	11.04	78.7	58.6
Mobile	4.69	83.4	58.3

Meteorological record for the cotton districts for the month of April, 1882.

Districts.	Average rainfall.	Mean of maximum.	Mean of minimum.
	Inches.		
New Orleans	5.63	81.9	59.9
Savannah	3.73	81.1	60.2
Charleston	2.66	77.5	54.5
Atlanta	4.49	76.8	54.9
Wilmington	3.88	74.2	50.0
Memphis	5.29	74.9	54.0
Galveston	1.58	82.1	57.9
Vicksburgh	7.03	78.6	56.8
Montgomery	4.92	78.5	57.2
Augusta	3.05	78.2	54.7
Little Rock	4.74	75.9	51.9
Mobile	3.80	79.1	57.8

WINDS.

The prevailing winds at Signal Service stations during the month of June, 1882, are shown on Chart II by arrows, which fly with the wind. In New England, the Middle, and Southern States, and from the Ohio Valley westward to Colorado, the winds were southerly; in Texas, and at stations on the Southern Slope, south to southeasterly; in the Upper Lake region and the Extreme Northwest, northerly to easterly; in the Upper Mississippi Valley and in the Plateau Regions, variable; in the Missouri Valley, southeasterly, and on the Pacific coast, northwesterly to southwesterly.

Total movements of the air.—The following are the largest total movements at Signal Service stations: Mount Washington, 28,235 miles; Pike's Peak, 15,023; Hatteras, 12,410; Kitty Hawk, 9,969; San Francisco, 9,739; Macon, N. C., 9,610; Indianola, 9,351; Sandusky, 9,342; Concho, 9,339; Galveston, 9,329; Delaware Breakwater, 9,303; New Shoreham, R. I., 8,957; Stockton, Tex., 8,910; Fort Elliott, Tex., 8,749; Cape Henry, Va., 8,749; Champaign, Ill., 8,415; Dodge City, 8,249; Milwaukee, 8,178; Sandy Hook, 8,044. The smallest are: Vicksburgh, 1,895; La Mesilla, N. Mex., 1,967; Silver City, N. Mex., 2,360; Lynchburgh, 2,447; Roseburgh, Oreg., 2,591; Nashville, 2,634; Augusta, Ga., 2,636; Missoula, Mont., 2,733; Olympia, 2,775; Tucson, 2,791; Fort Smith, Ark., 2,965.

High winds.—The following high velocities were reported from the summit of Mount Washington: 1st, 84 miles, SW.; 2d, 77, NW.; 9th, 75, NW.; 19th, 92 W.; 20th, 80, NW.; 21st, 80, NW.; 25th and 26th, 95, NW., maximum for the month. On all other days during the month, velocities reached or exceeded 50 miles per hour, with the exception of the following: 4th, 6th, 11th to 14th, 23d, and 30th. Stations reporting velocities of 50 miles per hour or over are as follows: Pike's Peak, 64 W., 17th; Fort Benton, Mont., 64, W., 20th; Yankton, 61, NW., 24th; Saint Louis, 61, N., 17th; Fort Elliott, Tex., 60, NE., 12th; Indianapolis, 60, W., 20th; Dodge City, 56, NW., 30th; North Platte, 53, E., 19th; Fort Custer, 52, W., 28th; West Las Animas, Colo., 52, SE., 19th; Henrietta, Tex., 52, NW., 12th; Nashville, 52, W., 18th; Hatteras, 52, SW., 1st; La Crosse, 50, SW., 24th.

Local storms.—There have been in the month of June many tornadoes and severe storms which have resulted in great loss of life and destruction to property. By far the most disastrous was the tornado which swept through eastern Iowa on the 17th of the month.

The following accounts of storms have been arranged in States and in successive dates as nearly as possible: *Arkansas:* Osceola, 17th, a severe wind-storm, accompanied by hail, unroofed several houses and totally demolished one. Much damage was done to crops. *Dakota:* Wicklow, 24th, a severe storm occurred, accompanied by rain and hail. Considerable injury was done to farm property and crops, the wind reaching a velocity of 60 miles per hour, from the SSW. At Forestburgh, 25 miles northwest of Alexandria, 24th, a severe storm occurred, several buildings were blown down. Yankton, 24th, severe storm, several building in the country blown down. The steamer Tompkins was blown from her moorings. *Georgia:* Atlanta, 17th, severe thunder and rain storm, accompanied by hail; the wind attained a velocity of 49 miles per hour. Many trees in the suburbs were blown down. Forsyth, 18th, a violent wind and rain storm occurred west of this place doing much damage to crops and fences. *Illinois:* Geneseo, 17th, during a heavy storm, the spires of two churches were blown down and several buildings were more or less damaged. At Oregon, the storm was equally severe, many barns and outbuildings were blown down by the wind or carried off by the flood. Clinton, 17th, a heavy wind and rain storm passed over DeWitt County, doing a large amount of damage to farm property and crops. The storm passed from NW. to SE., and is described as being a whirlwind; in Wilson township it demolished a barn and injured much stock, and the rye crop, which was nearly ready to harvest, was greatly injured and numbers of fruit trees were uprooted. Vandalia, 17th, the storm was accompanied by rain and vivid lightning; much of the wheat crop was blown down and also a considerable amount of timber. The Okaw bottom-lands were submerged and several hundred acres of corn were under water. Carmi, 17th, during a severe wind-storm, the opera house was unroofed and several buildings sustained severe damage. Many fruit and shade trees were destroyed. At Lebanon, Salem, and Edwardsville, the storm was more or less severe; some damage was done to wheat, but not so much as in other districts. Cairo, 17th, 3.10 p. m., the wind suddenly veered from northwest to southwest, when a tornado appeared, which lasted from 3.10 to 3.35 p. m. The storm-cloud advanced from the northwest and was of a dense black color in front, while the northwestern edge of the cloud presented a smooth surface, having a greenish hue. A roaring noise, and a rotating cloud of dust, which enveloped every object in its path, preceded the storm. Several houses were unroofed, including the United States custom-house, and twenty empty freight cars were derailed and overthrown by the wind. The track of the storm was from west to east, passing through Alexander, Pulaski, and Massac Counties, and was from 8 to 10 miles wide. In the center of the track, large hail fell, but none was observed at this station; trains were delayed by the fallen trees across the track, and one man was killed, and others were more or less injured. Steamers had their smoke-stacks blown down, others broke adrift and sank, or sustained great damage. The total damage caused by this storm, in southern Illinois, is estimated at $16,000. Morrison, 24th, a severe storm of thunder, lightning and rain occurred at this place, several buildings were damaged by lightning and many hundreds of fruit trees were destroyed. Rockford, 24th, a tornado and heavy hail-storm occurred; hail-stones were as large as hen's eggs, and nearly every window in town was broken. The storm caused great damage to fruit and other crops. Champaign, 25th, from 2.45 to 4.45 p. m., a severe gale caused much damage, especially in the northwestern part of the city; a large barn was blown down, fruit trees uprooted or broken off, and great damage resulted to corn and other crops. Charleston, 25th, heavy storm during the evening, many orchards were destroyed and forest trees blown down. Oregon, 30th, a heavy storm of wind and rain, accompanied by thunder and lightning, caused great damage. Fifteen houses were damaged by lightning, and one person was killed; bridges were swept away, and hundreds of acres of grain were entirely ruined. The damage in the town and vicinity is estimated at $50,000.

Indiana: Indianapolis, 16th, severe thunder-storm, accompanied by high wind and very heavy rain, occurred at 4.30 p. m. Many streets were flooded and several buildings were damaged by lightning; hundreds of shade trees were blown down or broken off. Shelbyville, 16th, severe storm, with torrents of rain; streets were inundated and the southwestern part of the city was under water. North Vernon, 16th, several buildings were damaged by lightning and flood, and growing crops sustained great injury. Saint Meinrad, 17th, during a fierce northwest gale, with heavy thunder and rain, many forest and fruit trees were uprooted. Indianapolis, 25th, at 6 p. m., heavy wind-squall swept over the city. Many houses were unroofed, and fences and trees were blown down. The greatest damage caused by the storm was the destruction of the steeple of Saint Paul's cathedral. The wind attained a velocity of 60 miles per hour and the duration of the squall did not exceed one minute. The total damage to the city is estimated at $20,000.

Iowa: Iowa City, 17th, a tornado visited this place, demolishing several houses and other buildings and causing considerable damage to other property. Davenport, 17th, very severe storm; telegraph wires were prostrated and much damage was done to buildings. Ames, 17th, at 7.45 p. m., a tornado passed about three-quarters of a mile south of that place. The width of the teack was from 30 to 40 rods, and the tornado pursued an easterly course. Grinnell, 17th, the tornado at this place was of unequaled severity, and wrought great destruction to life and property. From reports at hand, the tornado appears to have formed in Green County, in the center of the western half of the State, and about 90 miles west of Grinnell. The tornado pursued an easterly course through Boone and Story Counties, and almost parallel with the Chicago and Northwestern Railroad as far as Marshall County, here its course changed to the southeastward toward Poweshiek County. Persons residing at Ogden, 15 miles east of Jefferson, Green County, saw the tornado pass along a little to the south of that place, but no damage was done in that vicinity, as the tornado probably did not strike the earth near there. Three persons were killed, and considerable damage was done near Nevada, Story County, and much damage was also done in Jasper County during the passage of the tornado-cloud. At Rock Creek township, Jasper County, 15 houses were demolished and four persons killed. The tornado then advanced toward Grinnell, where it proved more destructive than at any point along its track, causing great loss of life; it then passed southeastward, and it is probable that the same tornado caused the destruction at Mount Pleasant, in Henry County. The distance from Jefferson, where the storm was first observed, to Mount Pleasant, is, following the track of the tornado, about 200 miles, and as it was first observed at 7.30 p. m. at Jefferson, and the damage occurred at Mount Pleasant at about 11 o'clock, it would appear that the tornado traveled at about 55 or 61 miles an hour. Respecting the destruction caused by this disastrous storm, the following is given: The storm-cloud, which was of the usual funnel-shaped appearance, and accompanied by a roaring noise, floods of rain, and a vivid electrical display, struck the town about 8.30 p. m. of Saturday, June 17. The width of the track appears to have been comparatively narrow, but within its limits everything was destroyed; it entered the town from the west, and moved a little north of east, laying the entire northwestern part of the town in ruins, nearly all the buildings being crushed to splinters by its terrific force, and the streets flooded to a depth of one foot of water. The total damage was inflicted in five minutes, not less than one hundred dwellings in the town being reduced to ruins. The tornado then turned toward the southeast and struck Iowa College, a three-story brick building, which was leveled to the ground, some of the students being killed and others injured. A train, consisting of an engine and 21 cars, was wrecked about one and a half miles east of the town, 14 cars being blown from the track by the terrific force of the wind. The number of persons killed amounts to about 60, and 150 were more or less seriously injured; the number of houses destroyed and damaged is 140, and the loss of property will amount to about $600,000. Before reaching the town, the tornado devastated several farms in its track, killing or seriously injuring the inmates of the dwellings. Some of the houses appear to have been blown outward, while others were lifted up and carried some distance, then deposited in splinters on the ground. The storm then passed eastward, with unabated fury, to Malcolm, a small town of about 800 people, 8 miles east of Grinnell; it struck this place in its northern half, and wrought destruction as complete as at Grinnell. Houses were blown down and completely demolished, two churches were ruined, 7 persons were killed and a number were seriously injured, and much stock was also killed. Leaving Malcolm, the tornado struck Brooklyn, where it inflicted serious damage to life and property; at this point it took a southeasterly course toward Henry County, and finished its work of destruction at Mount Pleasant. The tornado struck that place at about 11 p. m., and in a few minutes had caused great damage to buildings, fences, merchandise, &c. The storm continued to rage with violence for two hours, but the greatest destruction occurred at its beginning. Houses were blown down or unroofed, churches were unroofed and the steeples swept away, and orchards and crops more or less ruined. Nearly all the houses were unroofed and their interiors were deluged by the heavy rain, causing great damage to goods. Some loss of life is also reported from this place, while many persons have been injured. The damage to property and crops in the town and vicinity is estimated at $500,000. It is probable that the total number of lives destroyed by this tornado, during its entire path, will amount to more than 100, while the damage to property is incalculable.

Dubuque, 22d, at 5.50 p. m., a heavy thunder-storm with violent gusts of wind burst over the city. Trees were uprooted and fences and outhouses, sheds, &c., were blown down. Considerable damage was done in the northern and western parts of the city. Independence, 22d, a severe storm of hurricane force burst over that place between 4.30 and 5.00 p. m. It would appear that this storm was a violent and exceptional windstorm, yet it partook somewhat of the nature of a tornado, having at times the spiral and twisting motion characteristic of tornadoes, but it was without the funnel-shaped cloud, and only displayed the whirling motion at intervals. Many houses were blown down or unroofed, and a number of outbuildings and large quantities of fencing were carried completely away. A large smoke-stack, 130 feet high, was leveled to the ground; two persons were killed and several injured; the loss of property amounts to about $150,000. The track of the storm was not extended, and was about 20 miles in length. It formed east of Cedar River and visited Jessup at about 4.35 p. m., and was very severe at that place. Rain fell in torrents, flooding the streets, and the wind swept everything before it; maple trees ten inches in diameter were twisted off, several houses were unroofed, and a great many barns were totally wrecked. At Pleasantville, Marion County, some damage was also done to buildings, and also in the townships of Walker and Rowley. Emmittsburgh, 24th, a tornado passed through Clay County, doing considerable damage, and struck Emmittsburgh about 7.30 a. m. The storm raged with terrific violence for 25 minutes, during which time many houses were demolished and others unroofed; barns and fences were carried away. Immense volumes of water from Swan Lake were caught up and dashed against the houses left standing. Four persons were killed and several were injured; during the passage of the storm through Clay County 20 farm houses were blown down and 4 persons were killed. Patterson, 24th, a heavy wind and rain storm did considerable damage; a store, five dwellings, and two stables were blown down, and many farms in the vicinity were more or less damaged. Hoopersville, 24th, a hurricane, which lasted 15 minutes, caused great damage; a church, school-house, and 25 dwellings and barns were more or less damaged, and one man was fatally injured. Cedar Rapids, 29th, a furious storm occurred, but did not strike the ground except in a few places, where it caused much damage.

Kansas: Atchison, 16th, one of the most severe storms ever experienced occurred at Atchison on the above date. Rain fell in torrents, flooding cellars and basements, and the electrical phenomenon was particularly brilliant, the heavens appearing as one blaze of light for two hours. Several houses were struck by lightning and injured, while many others were either completely demolished or unroofed. All telegraph wires were prostrated and railroad travel suspended. No lives were lost during the storm, but many persons were injured. The damage in the town is estimated at $15,000. On the Santa Fé Railroad, 20 miles east of Topeka, 15 freight cars were blown from and across the track; growing crops were much injured, corn being flattened and broken, and in some sections the damage is irreparable. Leavenworth, 17th, the heaviest and most destructive wind-storm ever known visited this station. The storm began at 12.13 a. m., and for five minutes the wind registered a velocity of 72 miles an hour, and during that five minutes the most of the damage occurred. Many buildings were unroofed and frame structures blown down; the top of the Kansas Central Elevator was blown off and the building twisted off its foundation; trees were uprooted and others broken off close to the ground. The storm struck the Mount Saint Mary's Female College, a few miles south of the city, and blew down the main tower of the building; the tower fell on the roof and crushed through the dormitories, killing four children and injuring many others. A man is reported to have been blown into the Missouri River and drowned, near the

Union depot. Fruit was stripped from the trees, but wheat is reported to be not seriously injured. The total damage to the city is estimated at $200,000. Topeka, 17th, the storm did considerable damage, unroofing many buildings and uprooting trees; no loss of life or stock is reported. Valley Falls, 17th, a building was blown from its foundation and another unroofed. Hundreds of trees were broken off, and the damage to the fruit crop is very great, but field crops did not suffer much injury. 25th, a tornado passed through Phillips County, doing considerable damage at Kirwin; the storm pursued an easterly course and struck the town of Marysville, where it did much damage. Residences, churches, and barns were demolished and several persons were more or less injured; the same storm wrecked a train near Talmage and demolished five houses at Avola, about three miles from Talmage. Several persons are reported killed and some injured.

Kentucky: Anchorage, 15th, heavy thunder and rain storm, accompanied by hail. Several buildings were set on fire and completely destroyed by lightning.

Michigan: 8th, a tornado swept through Saint Clair County on the night of this date. It first began as a wind and rain storm, which continued for about two hours, when black and heavy clouds formed in the northwest and advanced across the county. The tornado swept away houses, barns, fences, etc., and all farming implements in its path. Objects were lifted upwards and deposited at several rods distant from their starting point. Great destruction occurred to crops and orchards, and in some parts of its track not a single tree was left standing and several persons were more or less injured. The width of the track varied from 30 to 80 rods. 18th, a tornado occurred in Saginaw County, and sweeping through a part of Huron County, struck the lake south of Port Austin and formed two distinct water spouts, which passed rapidly eastward. In the track of the tornado cloud, which was funnel-shaped and accompanied by a roaring sound, buildings were lifted from their foundations and demolished, the inmates sustaining, in some cases, serious injury. Many barns were destroyed and much valuable stock was killed; in the townships of Grant, Brookfield, and Bad Axe, several buildings were destroyed and standing timber was twisted off and carried away. The storm was accompanied, in some places, by heavy rain and hail. 24th, a severe storm passed through Livingston County on this day, destroying crops, fruit, fences, &c.; and several persons were injured.

Maine: Gardiner, 26th, at 5.45 p. m., a severe northwest storm occurred. Several large trees were blown down and an ice-house was unroofed; the extreme violence of the gale lasted about ten minutes.

Missouri: Saint Louis, 16th, a severe storm began on this date and increased in force until the 17th. The wind blew with great violence, reaching a velocity of 60 miles per hour; rain fell in torrents and the storm was accompanied by heavy thunder and a vivid and brilliant display of lightning. In the city, chimneys, signs, windows, and trees were blown down and telegraph wires were prostrated. It is estimated that $10,000 will cover the loss. The greatest damage occurred along the river; steamboats dragged their moorings and were carried down the river, and others collided with irresistible force and sank; a large number of coal flats were more or less damaged. It is estimated that the loss to steamboat property will exceed $25,000. Kansas City, 17th, a hurricane of wind and rain broke over the city at about 1 a. m. The storm passed through Clay County, blowing down or unroofing houses, leveling fences and uprooting the largest and strongest trees. Fruit trees and corn were prostrated, and irreparable injury was done to the wheat crop. The storm was accompanied by incessant and blinding flashes of lightning, the heavens appearing fairly ablaze. Many large buildings were blown down or unroofed, several blocks being completely destroyed. Several persons were buried in the falling ruins and many valuable horses were killed. The damage to property in this city will probably exceed $150,000. At Missouri City, many houses, outbuildings, and fences were swept away, and growing crops were beaten down by the severe hail which accompanied the storm. No loss of life has been reported at that place, although several persons were more or less injured. Brownsville, 17th, the storm struck that town at about 2 a. m., and was accompanied by heavy rain and hail. Houses and fences were blown down, and chimneys shattered to pieces. A large frame building was lifted from its foundation and deposited six feet from where it formerly stood, and the Christian church, which escaped the tornado of April, was blown down. Belton, Cass County, 17th, the track of the tornado at this point was only about 40 feet wide, but in its track orchards were destroyed, fences blown down, and crops, to some extent, were injured. A house was picked up bodily and dashed to pieces, the inmates, four in number, being more or less seriously injured; a new barn was also blown down. At Marshall, Saline County, the tornado caused great damage to buildings and to the wheat and oat crops.

Nebraska: Omaha, 25th, masses of heavy dark clouds advanced with a rolling motion from the northwest until they reached the city, when they broke in a furious storm of wind, rain, and hail. The wind reached a velocity of 60 miles per hour for a few minutes, and then fell to a steady velocity of 34 miles per hour. Signs were wrenched off, trees uprooted, and some houses unroofed, but the principal damage appears to have resulted from the heavy rains, which swelled the creeks, causing them to overflow; many buildings were flooded and others carried from their foundations. Some damage also resulted from the heavy and continuous hail which accompanied the storm. 25th, a severe storm formed in Butler County, and swept in a southeasterly direction through Saunders, Lancaster, Cass, Nemaha, and Otoe Counties, destroying nearly all small grain and beating down the corn. The storm was accompanied by hail, which caused much destruction; at Wahoo, several dwellings were unroofed and all windows facing the west were demolished; a herd of ponies was blown eight miles southward; at Clear Creek, a school-house was demolished, and severe damage was done at Brainard. At Lincoln, the storm was also very severe, most of the orchards and crops being ruined by the large hailstones. Several persons were injured during the storm, some fatally.

New York: Amsterdam, 17th, a tornado struck the town and did considerable damage to the buildings of light construction. The storm-path was 60 feet wide.

New Jersey: Freehold, 4th, 9.20 to 10.15 p. m., a destructive storm occurred over a strip of country south of this place. Hail fell to a depth of two inches, causing damage to the amount of more than $1,000 to crops in the immediate vicinity, and several houses were injured. 27th, severe thunder-storm, accompanied by hail, which was mostly jagged, broken ice, some pieces of which measured 1⅝ inches long and half an inch thick. From 5.50 to 5.57 p. m., the wind reached a velocity of 60 miles per hour. Reports from localities southwest of Freehold state that much damage was done to crops.

North Carolina: Weldon, 4th, a destructive tornado, originating in Southampton County, Virginia, swept through Northampton and Halifax Counties; many houses were blown down and crops were completely ruined. The storm was accompanied by heavy hailstones of unusual size, which covered the ground to a depth of several inches. At Weldon several buildings were blown down, and two children were killed by falling timbers. At Garysburgh the Felter Academy was blown down. The damage to property by this storm will amount to several thousand dollars. Kitty Hawk, 28th, severe wind-storm, telegraph poles were prostrated, and one house was blown down.

Ohio: Sandusky, 18th, severe wind storm, many telegraph poles and trees blown down. 30th, a heavy wind-storm occurred over southern Ohio, telegraph wires and trees were prostrated, and growing crops were blown down, corn and oats being broken off by the heavy rain, and several houses were unroofed.

South Carolina: Stateburgh, 22d, about 3 miles north of station, a storm of considerable energy occurred. Much damage was done and several large trees were uprooted.

Tennessee: Nashville, 18th, a severe wind-storm, reaching a velocity of 52 miles an hour; trees, fences, and awnings were destroyed, and several houses were unroofed. Spring City, Rhea County, a tornado occurred on the 25th; several buildings were blown down.

Texas: Henrietta, 12th, at 7.20 p. m., a severe storm burst over the city, doing considerable damage to buildings. The storm cloud had a whirling motion, and dipped occasionally toward the earth, each dip being attended with great destruction. A house was twisted off its foundation, and many barns and outbuildings were blown away. As the storm cloud only struck the ground at intervals, many houses in its close proximity were left untouched. The total damage is estimated at $6,000.

Vermont: Woodstock and Strafford, 19th, a severe wind-storm passed through these places; many buildings and fences were blown down and trees uprooted. The track of the storm was about 15 miles in length and from 1 to 5 miles in width.

Wisconsin: 27th, a tornado formed near the village of Onalaska and passed through that place at 10.45 a. m.; it then passed in a northeasterly direction through La Crosse, Monroe, and part of Vernon Counties. The whole distance traveled was about 40 miles, and the width of the track was about 80 rods. Several buildings were unroofed, but the principal damage was done to the crops, which were in some cases completely carried away; great numbers of fruit trees were twisted and broken. The towns of Bangor, Washington, Jefferson, and Sheldon were also visited by the storm and sustained more or less damage. One person was seriously injured; the damage to buildings is estimated at $20,000, and the damage to crops cannot be estimated. The observer at La Crosse reports the appearance of the storm cloud, as follows: The storm cloud appeared of a dark blue or nearly black color, followed immediately by a cloud which appeared to be highly illuminated and of a yellow color, changing at times to green. After the cloud passed the station the wind changed to north, with moderate breeze and light rain. Five miles from station, rain is reported to have fallen in torrents, many streams were swollen and bridges washed away. At Cashton the storm destroyed five houses and caused great damage to crops. Several persons were injured but none fatally.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for June, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 86.7 per cent. The percentages for the four elements are; Weather, 88.9; Direction of the Wind, 80.9; Temperature, 88.3; Barometer, 88.9 per cent. By geographical districts they are: For New England, 88.4; Middle Atlantic States, 90.1; South Atlantic States, 86.7; East Gulf States, 85.7; West Gulf States, 91.9; Lower Lake region, 85.7; Upper Lake region, 81.6; Tennessee and Ohio Valley, 88.5; Upper Mississippi Valley, 84.8; Lower Mississippi Valley, 82.9; Northern Pacific Coast region, 94.4; Middle Pacific Coast region, 98.9; Southern Pacific Coast region, 97.8.

There were 160 omissions to predict (37 being due to the absence of reports from the Pacific coast) out of 3,690, or 4.33 per cent. Of the 3,530 predictions that have been made, 109, or 3.08 per cent., are considered to have entirely failed; 92, or 2.60 per cent., were one-fourth verified; 368, or 11.30 per cent., were one-half verified; 365, or 10.33 per cent., were three-fourths verified; 2,566, or 72.69 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary signals.—One hundred cautionary signals were displayed during the month of June, of which 82, or 82 per cent., were justified by winds of 25 miles per hour, at or within 100 miles of the station. Eight off-shore signals were displayed, all of which were fully justified as to direction and velocity. One hundred and eight signals of all kinds were displayed, of which 90, or 83.3 per cent., were justified. The above does not include signals ordered at 69 display stations, where the velocity is only estimated. Ninety-five winds of 25 miles per hour or over were reported, for which no signals were ordered. Fifteen signals were reported late.

NAVIGATION.

Stage of water in rivers.—In the table on the right hand of Chart III are given the highest and lowest stages of water observed at Signal Service stations during the month of June, 1882. In the first column of this table are given the heights of water on the gauge which have been found dangerous to property at stations: The Mississippi reached its highest stage at Keokuk on the last of the month, when it was 1 foot 3 inches above the danger line. At Cairo it was 2 feet above the danger line on the 6th of the month, and, on the 17th, it had fallen to 32 feet 4 inches, the lowest point reached during the month. At Vicksburgh it remained above the danger line during the month, the height of water ranging from 41 feet 6 inches to 41 feet 2 inches on the gauge. The Missouri River rose slowly during the month and reached its greatest height between Yankton and Leavenworth from the 27th to 30th. The Ohio, Cumberland, and Tennessee Rivers were highest on the 2d and 3d of the month, and lowest from the 15th to 28th, except the Tennessee at Chattanooga, where the lowest water, 4 feet 6 inches, occurred on the 13th. The observer at Nashville reports the suspension of navigation in the Cumberland River on the 16th. During the past two months navigation has been better than for any corresponding period during the past six or seven years. The highest water for the year ending June 30, 1882, 54 feet and 7 inches, occurred January 22; the lowest, 3 feet and 3 inches, occurred September 12, 13, 14.

Floods.—The excessive rainfall of the month has caused local floods in various sections of the country which were more or less destructive to life and property. The most disastrous flood of the month was that of Pogue's Run, Indianapolis, where 10 lives were lost and much property destroyed. Fort Missoula, Mont., 8th: The river overflowed, completely submerging the bottom-lands; all crops under cultivation were destroyed. Umatilla, Oreg., 9th and 11th: Severe washouts occurred along portions of the railroad between Umatilla and the Dalles; travel was suspended. Winnemucca, Nev., 11th: Five hundred feet of track west of the railroad station were washed away by heavy rain. Denver, Colo., 10th: During a heavy rain-storm the Dry Creek overflowed, sweeping away a number of houses and drowning 5 persons; cellars and basements were flooded, and at Golden several houses were washed away; the damage to property is estimated at $75,000. Paxton, Ill., 13th: A heavy rain-storm occurred, assuming the proportions of cloud-bursts in some places; the streets were flooded and several buildings were damaged. At Gibson City, Ford County, bridges were washed away and railroad embankments destroyed, impeding travel; the injury to crops in the county is very great. Winchester, Ky., 13th: Very heavy rain fell between 7 and 8 o'clock p. m. The waters of Two-Mile Creek were so increased in volume as to wash away a cabin containing 10 persons, all of whom were drowned; much damage was done to fencing along the streams in the county. Indianapolis, Ind., 14th: Heavy rains caused an overflow in Pogue's Run, a small stream running through the city. The Union depot, railroad track, and several streets were flooded, in some parts to a depth of from 3 to 4 feet. Many bridges were swept away, and a platform spanning Pogue's Run, on which a large number of people had gathered to watch the flood, was suddenly swept away, throwing the occupants into the swift current; many were rescued by bystanders, but others were swept out by the current into the tunnel under Union depot. Ten bodies have been recovered, but the total number drowned is not known. The cellars of many wholesale houses were flooded, damaging goods to a large amount. The total damage in the city is estimated at $150,000. This flood was the highest since 1865. On the 16th, heavy rains occurred, flooding several streets in the city. Rushville, Ind., 14th: A flood equaling that of 1866 caused much damage to the corn and wheat crops. Outside of the town all the railroad culverts are washed out, and the surrounding country is submerged. Several streets are flooded, and more than 1,000,000 feet of lumber almost ruined. Five thousand acres of corn are submerged near Lawrenceburgh. At Liberty, communication was cut off by the carrying away of bridges, and much damage resulted to crops. Sydney, Nebr., 14th: Ground flooded, and people living on low ground and in the valley were obliged to seek shelter on the roofs of their houses. Lebanon, Ohio, 14th: Barley and corn-fields submerged, and many railroad bridges in that section damaged. At Camden, the first floors of houses were under water, bridges were injured, and great damage to crops resulted from the heavy rains. At Middleton, Eaton, and Wilmington many washouts occurred, and bridges injured, many houses were flooded, and crops greatly damaged. Fort Scott, Kans., 17th: The track of the Missouri Pacific Railroad, two miles south of Fort Scott, was 3 feet under water. Heavy rains caused overflows in all the rivers of southern Kansas, doing more or less damage to the wheat crops. Railway travel was delayed. Cheyenne, Wyo., 19th: Several streets were flooded by the heavy rain. Cellars and basements were filled with water. Coleman City, Tex., 20th: The bottom lands were flooded and a large amount of lumber, wood, and fencing carried away by an overflow of the creek. Davenport, Iowa, 24th: Serious washouts occurred on the Chicago, Rock Island and Pacific Railroad; a train was wrecked by having the earth washed from under the ties. The loss of bridges in Fremont County will exceed $15,000. Hannibal, Mo., 28th: Bear Creek overflowed, sweeping 500,000 feet of lumber into the Mississippi River. Several houses were also swept away, and many bridges damaged. Two railroads have been abandoned, owing to destruction of bridges. Minneapolis, Minn., 23d: A heavy rain-storm at Owatonna caused great damage to crops, and washed away much farm machinery. Oregon, Ill., 30th: Severe rain storm, flooding the flats, and driving families from their homes; many bridges were damaged, and barns and out-buildings floated away. Lafayette, Ind., 30th: A heavy rain washed away the street crossings, fences, and filled the cellars and basements of houses. The damage to property amounts to several thousand dollars. Morrison, Ill., 30th: Rock Creek, near Malvern, rose 8 feet in one hour; bridges and mills were washed away and much stock drowned; two men were drowned at Empire. Elmira, 25th: From 1.20 to 4 p. m., a heavy rain-storm washed away bridges, fences, and did much damage. Paterson, N. J., 19th: During a heavy rain sewers were unable to contain the water; streets and cellars were flooded in all parts of the city. Variety Mills, Va., 23d: 3 to 5 p. m., during heavy rain, creeks overflowed and caused much damage to wheat and corn. At Keokuk, Iowa, the Mississippi River has been above the danger line throughout the month. On the 28th, the Des Moines levee was broken, flooding a large tract of farming land under cultivation; the railroad tracks were submerged and much damage was done.

Tidal wave.—A most remarkable phenomenon of this character occurred in Lake Erie at Cleveland on the 23d, concerning which the Signal Service observer at that station reports as follows: About 6 a. m. a dark, angry-looking cloud was observed over the lake, moving rapidly toward the shore. When first noticed this cloud was of moderate proportions, but as it advanced it extended in width and increased in height above its base, which remained at nearly the same elevation. It had the appearance of a heavy thunder cloud of an unusually low height, the lower part of which resembled a heavy curtain of grayish color hanging over the water and nearly parallel with the shore; above this, a contorted mass of cloud, whirling and writhing within itself, showed the existence of a disturbance of great violence. At 6.20 a. m., at distance of about half a mile from the shore, was noticed an immense wave directly under the curtain-like cloud, moving silently inward with terrific velocity, without crest until it reached the shallow water near the shore, when a white, foaming crest formed. A moment later it broke upon the shore with a deafening sound. When the wave entered the shallow water the cloud passed overhead, while scarcely more than a gentle breeze was felt. This inrushing of the water was followed by two recoiling waves about 100 feet apart, which could be seen for a long distance moving back into the lake with about the same velocity as an ordinary storm wave. Following this, the water, which seemed piled up along the shore, soon subsided. Preceding this phenomenon, the lake was unusually calm. At 6.35 a. m. a brisk shower set in, lasting fifteen minutes. No peculiar atmospheric conditions preceded the disturbance; the maximum wind velocity in this city for the eight hours preceding 7 a. m. did not exceed ten miles per hour, but the wind blew fiercely south of the city, and at the mouth of the river vessels parted the lines. Hundreds of fish were cast ashore, and the fires in the Lake Erie rolling-mills were put out. A scow loaded with sand at the breakwater was landed high and dry upon the shore. Some iron rails, 28 feet long, piled near the depot, were lifted and scattered in every direction. The wave broke completely over the railroad tracks along the shore, covering them to a depth of several feet and submerging the Erie street pier. On this pier, the flooring of which is 8 feet above the level of the lake, a boat-house was wrecked and a man washed overboard and drowned. The damage to property along the shore is roughly estimated at $30,000. The wave is known to have extended from a point 5 miles east of this city to Fairport, a distance of 35 miles. Steamboat men who arrived during the morning report the occurrence of a short squall and sudden movement of the water off this port, of which no especial notice was taken at the time. The Signal Service observer at Erie reports that between 1.30 and 2.00 p. m. the tidal wave was also slightly felt at that city; the water suddenly rushed over the piers, floating away lumber, &c. A similar tidal wave occurred on Lake Erie May 10, 1823, at Otter Creek, on the Canada shore, and at Kettle Creek, 20 miles distant, which attained a height of 9 feet. In 1830 three waves were observed at Madison Creek, Ohio, the first rising 15 or 20 feet. In 1844 or 1845 a wave came into Euclid Creek 15 feet in height. On June 15, 1872, the water rose 26 inches at Charlotte, on the mouth of the Genesee River. On November 18, 1845, the water at Cleveland suddenly fell 2.8 feet during a high wind from the southwest, and, according to the Toledo Blade, a change of 10 feet in the waters of Lake Erie took place December 5, 1856. In May, 1855, a similar phenomenon was observed on Lake Seneca, the water continuing to rise and fall from 16½ inches to 2 feet during two days. Old residents of Conneaut, Ohio, remember a sudden rise of 4 feet in the lake, covering the orchards upon the flats for several weeks and compelling the people to gather their fruit in boats. Similar agitations of the waters occurred on Lake Geneva, in Switzerland. In 1841, at Berne, the water receded to such an extent as to leave the ships that were at anchor on bare ground. Like phenomena have occurred on Lake Superior. In 1789, opposite Isle Royal, the water suddenly fell 4 feet, returning with a great rush. In 1834 the waters above Sault Rapids suddenly receded, and in half an hour returned with great velocity. In August, 1845, an enormous wave, 20 feet in height, was observed between Copper Harbor and Eagle River, rolling toward the shore. In 1847, 1848, and 1849, sudden rises and falls of the waters were repeatedly observed to precede or follow storms on the lake. In 1851, during a perfect calm, the water suddenly rose 1 foot and three inches, and during another 2½ feet. On July 17, 1855, extreme fluctuations on Lake Superior took place between 9 in the morning and 4 in the evening. Other remarkable phenomena of a like nature occurred at the mouth of the Sault Saint Marie, on Lake Huron, in 1856, and at the head of Lake Erie, at Monroe, Mich., in 1844.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the right hand of Chart II. In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the same period.

The following table gives the highest and lowest temperature of water at the several stations, with the range of water temperature, mean temperature of the air at the station, and the depth of water at which the observations were taken. It will be seen that the greatest ranges are: 22°.4 at Thatcher's Island, 22° at Toledo, 21° at Grand Haven, 19°.3 at Alpena, and 19° at Chincoteague. The smallest are: 4°.4 at Key West and 5°.4 at Eastport.

Temperature of water for June, 1882.

Station.	Temperature at bottom.		Range.	Average depth.		Mean temperature of air at station.
	Max.	Min.				
	°	°	°	*Ft.*	*In.*	°
Atlantic City	71.5	55.3	16.2	6	7	66.6
Alpena	69.8	50.5	19.3	12	0	57.8
Augusta	88.8	78.0	10.8	6	6	78.6
Baltimore	79.5	68.0	11.5	9	9	74.0
Boston	66.5	51.0	15.5	25	0	65.9
Buffalo	71.0	54.3	16.7	10	5	62.4
Burlington						
Cedar Keys	87.0	74.0	13.0	9	7	79.9
Charleston	84.1	75.4	8.7	41	5	79.3
*Chicago	67.0	64.0	3.0	7	9	63.6
Chincoteague	83.0	64.0	19.0	6	0	69.7
Cleveland	72.2	56.1	16.1	14	0	66,2
Detroit	70.0	54.0	16.0	24	4	67.2
Duluth	62.0	45.0	17.0	14	4	57.9
Delaware Breakwater	69.4	57.0	12.4	8	2	67.9
Eastport	44.2	38.8	5.4	17	3	56.2
Escanaba	67.0	49.0	18.0	15	0	59.5
Galveston	85.0	69.0	16.0	14	8	81.3
Grand Haven	72.5	51.5	21.0	19	0	62.9
Indianola	86.3	76.4	9.9	9	4	81.1
Jacksonville	87.0	77.0	10.0	18	0	91.1
Key West	89.1	84.7	4.4	16	8	84.3
Marquette	52.9	45.9	7.0	10	11	56.5
Milwaukee	61.5	44.6	16.9	8	0	61.4
Mobile	86.3	74.5	11.8	15	11	81.3
New Haven	75.2	58.0	17.2	15	2	66.2
New London	63.0	56.0	8.0	12	8	65.9
Newport	67.5	52.0	15.5	11	0	64.2
New York	73.0	59.0	14.0	22	11	66.1
New Shoreham	63.5	51.0	12.5	8	7	66.4
Norfolk	83.0	69.0	14.0	17	2	75.2
Pensacola	83.8	74.5	9.3	17	10	79.8
Portland, Me	57.6	45.0	12.6	19	0	65.1
Portland, Oreg	64.5	53.4	11.1	82	3	62.7
Port Eads						
Provincetown	68.5	53.0	15.5	14	0	64.1
Punta Rassa	90.5	80.1	10.4	11	9	80.5
Sandusky	76.4	59.3	17.1	10	0	67.0
Sandy Hook	67.2	55.0	12.2	1	5	68.7
San Francisco	61.5	55.9	5.6	28	7	57.0
Savannah	87.4	76.8	10.6	12	2	80.3
Smithville	83.0	74.0	9.0	10	0	76.9
Thatcher's Island	67.4	45.0	22.4	7	0	61.7
Toledo	81.0	59.0	22.0	11	8	68.1
Wilmington	85.5	75.0	10.5	13	0	76.9

* Observations wanting, from 1st to 26th, inclusive.

ATMOSPHERIC ELECTRICITY.

Auroras.—The most extensive display of the month occurred on the evening of the 14th. It was reported by numerous stations throughout the northern part of the United States. The line of observation extended from Mount Washington, N. H., to Dayton, Wash. The most southerly stations at which it was observed were Springfield, Ill., and New Corydon, Ind. On the summit of Mount Washington it is reported to have been a faint display, lasting from 8.20 p. m. to the morning of the 15th. Buffalo, from 11.15 p. m., to 1.40 a. m. of the 15th, faint aurora, consisting of a whitish light, seen through the broken clouds. Davenport, Iowa, 11 p. m., until midnight, consisting of a diffuse yellow light, extending to an altitude of 30°. Saint Paul, 10.20 p. m., aurora consisting of a diffuse light of a pale straw color, with dark segment beneath. At 11 p. m. vertical beams shot upward to an altitude of 45°; they were of straw color near the base, and the upper extremities were of a rosy hue. Before disappearing the beams acquired a tremulous motion from west to east. At 11.25 p. m. the display was obscured by clouds. Bismarck, Dak., 9.30 p. m., faint display; at 10.30 p. m., it extended to the zenith; faint stationary beams and two arches were visible. Helena, Mont., 10 p. m., brilliant aurora covering 30 of the northern horizon. A perfect arch was formed, with numerous parallel rays proceeding from a bank of luminous clouds; these rays had a graceful, undulating motion, and extended nearly to the zenith. The display was most brilliant at midnight, and disappeared at 1 a. m. of the 15th.

Numerous displays of less importance have been reported by various stations as follows: 4th, New Corydon, Ind., 9 p. m. 6th, Vevay, Ind., 9 p. m.; Burlington, Vt., 11 to 11.40 p. m.. 7th, Saint Vincent, Minn., 11 p. m. to 1 a. m., of 8th; Moorhead, Minn., 9 to 9.30 p. m. 12th, New Corydon, Ind., 10 p. m.; Embarras, Wis.; Thornville, Mich.; Gardiner, Me., 10 p. m.; Thatcher's Island, Mass., 11 p. m. 13th, Atlantic City, N. J., 10.30 p. m.; New Corydon, Ind., 11 p. m. to 2 a. m. of 14th. 15th, Oswego, 11 p. m.; Saint Paul, 9.30 p. m.; Atlantic City, N. J., 12.10 to 3.05 a. m. of 16th.; Manitowoc, Wis.; Madison, Wis., 10.30 p. m.; Duluth, Minn., 10.30 to 11.45 p. m.; Clinton, Iowa, 11 p. m.; Monticello, Iowa, 10 p. m.; Springfield, Ill., 10.40 to 11.20 p. m.; Moorhead, Minn., 1 to 3 a. m. of 16th; Bismarck, Dak., 8 to 11 p. m.; Burlington, Vt., 10 to 11.40 p. m.; Northfield, Minn.; Independence, Iowa. 16th, New Corydon, Ind., 10 p. m. to 2 a. m. of 17th; Springfield, Mo., 11.15 to 11.45 p. m. 17th, New Corydon, Ind., 11 p. m. 18th, Fort Meade, Dak. 19th, Saint Paul, 9.30 to 11 p. m.; Alpena, Mich., 8.50 p. m. to 1.30 a. m. of 20th. 20th, Fort Custer, Mont., 10 to 11.10 p. m.; Bismarck, Dak., 11 p. m. to midnight; Eastport, Me., 9 to 11.40 p. m.; Gardiner, Me., 9 p. m.; Thatcher's Island, Mass., 11 p. m. to 2 a. m. of 21st. 21st, Fall River, Mass., 9 p. m.; Cambridge, Mass., 10.15 p. m. to 12.15 a. m. of 22d; Springfield, Mass., visible shortly after midnight; Gardiner, Me., 12.30 a. m. 22d, Eastport, Me., 8.15 to 11 p. m.; Mount Washington, 8 p. m. to a. m. of 23d; Burlington, Vt., 11 to 11.45 p. m.; Marquette, Mich., 10 to 10.40 p. m. 23d, Mount Washington, 9 to 10.20 p. m.; Burlington, Vt., 11 to 11.45 p. m.; Alpena, Mich., 9.25 p. m. to 3 a. m. of the 24th. 24th, Manasquan, N. J., 8.30 p. m.; Little Egg Harbor, N. J., during early evening; Fort Myer, Va., 9.05 to 9.15 p. m. 25th, Marquette, Mich., 11 to 11.20 p. m.; New London, 1.20 to 4.15 a. m. of the 26th; Agawam, Mass., during early morning.

Thunder-storms.—Thunder-storms were reported in the various districts on the following dates: *New England*, 4th, 6th to 9th, 15th to 19th, 23d to 29th. *Middle Atlantic States*, 1st, 3d to 6th, 9th to 11th, 14th to 28th. *South Atlantic States*, 1st, 4th, 6th, 10th, 11th, 15th to 23d, 25th to 30th. *Florida Peninsula*, 1st, 4th, 8th to 13th, 20th to 23d, 26th, 27th, 29th, 30th. *East Gulf States*, 3d, 8th to 16th, 20th to 30th. *West Gulf States*, 2d, 3d, 6th, 7th, 9th to 16th, 18th, 19th, 21st, 25th, 26th, 30th. *Rio Grande Valley*, 5th, 6th, 9th, 11th, 13th, 19th. *Ohio Valley and Tennessee*, 1st, 3d, 8th to 30th. *Lower Lake region*, 3d, 7th to 10th, 14th to 19th, 23d to 26th, 28th, 30th. *Upper Lake region*, 6th to 10th, 12th to 18th, 22d to 25th, 27th to 30th. *Extreme Northwest*, 8th, 12th, 13th, 15th, 16th, 17th, 21st, 23d, 24th, 26th to 29th. *Upper Mississippi Valley*, 1st to 3d, 7th to 30th. *Missouri Valley*, 1st, 2d, 7th to 30th. *Northern Slope*, 1st, 2d, 6th to 14th, 16th, 19th to 30th. *Middle Slope*, 6th to 21st, 24th to 26th, 28th to 30th. *Southern Slope*, 2d, 5th, 7th to 14th, 16th, 18th to 21st, 25th, 30th. *Northern Plateau*, 4th to 6th, 8th to 11th, 18th, 23d, 26th, 27th. *Middle Plateau*, 3d to 5th, 8th to 14th, 19th, 20th, 28th, 29th. *Southern Plateau*, 3d to 10th, 13th to 19th, 27th to 30th. *Middle Pacific Coast region*, 10th, 12th, 30th. *South Pacific Coast region*, 15th, 16th, 18th, 19th.

Thunder-storms were also reported from the following stations not included in the districts named above: Portland, Oreg., 4th; Roseburgh, Oreg., 3d.; Olympia, Wash., 5th, 6th; Fort Bidwell, Cal., 2d, 25th, 26th; Salinas City, Cal., 9th, 30th; Carson City, Nev., 13th, 18th, 28th.

During thunder-storms the following instances of damage by lightning occurred: Mobile, Ala., 29th, lightning struck city tower, damaging the fire-alarm apparatus and the face of the city clock; several persons were stunned. Chattanooga, Tenn., 3d, lightning struck a dwelling in the southern section of the city. The chimney was torn to pieces, window panes were shattered, and an occupant of the house severely shocked. Grand Haven, Mich., 18th, building struck by lightning, damaging the front, side, and part of the roof; several persons were stunned. Newburgh, N. Y., 16th, a sloop was struck by lightning and one man killed. At West Newburgh a barn was struck, killing a horse and rendering two men unconscious. Reading, Pa., 16th, a stable containing 12 valuable horses was struck by lightning and entirely destroyed, entailing a loss of $4,000. Davenport, Iowa, 24th, lightning struck and set on fire Trinity church; several other objects were also struck. Winnemucca, Nev., 12th, lightning struck and entirely destroyed a milk-house, 4 miles south of station. Morrison, Ill., 16th, great damage done by lightning; a man killed near Coleta; 24th, several buildings struck by lightning. Riley, Ill., 30th, a large oak tree, within ten rods of the observer's house was struck by lightning. The trunk of tree measured about two feet in diameter. Nearly half of the tree was torn off, and some of the fragments, weighing from 75 to 100 pounds, were thrown a distance of 100 feet; other portions were hurled into the tops of the neighboring trees. Large pieces were split and twisted, resembling bundles of small rope. Port

Jervis, N. Y., 15th, lightning struck and considerably damaged the spire of the Catholic church; it also struck and damaged a building at Matamoras. Cleveland, Ohio, 17th, barn struck by lightning; one person killed. Variety Mills, Va., 21st, house struck by lightning near Livingston, killing three persons. The observer on the summit of Pike's Peak reports the occurrence of an unusual electrical phenomenon at that station on the 7th and 9th. At 8.45 p. m. of the former date, the telegraph line was distinctly outlined in bright light. On near approach to the wire small jets of flame about the size of a pencil lead and of a very bright violet color were observed. It was impossible to touch the flames as they vanished or escaped to other points on the wire. The cups of the anemometer, which were rapidly revolving, appeared as a ring of fire; the wind vane and other objects were also tipped with light. On approaching the light the hands and face of the observer were similarly affected, but no heat was felt. The phenomenon was preceded by lightning and thunder and was accompanied by a dense driving snow. It disappeared at 8.55 p. m., simultaneously with the cessation of the snow. A similar display also occurred on the 9th. West Las Animas, Colo., 12th, the observer reports that the points of the wind vane were tipped with flame and the anemometer cups revolved in a circle of light.

Atmospheric electricity interfering with telegraphic communication.—Coleman City, Tex., 13th; Fort McKavett, Tex., 8th, 19th.

OPTICAL PHENOMENA.

Solar halos.—Solar halos have been observed in the various districts on the following dates: *New England*, 5th, 6th, 7th, 10th, 13th, 15th, 17th, 19th, 21st to 24th, 26th, 28th to 30th. *Middle Atlantic States*, 7th, 8th, 14th, 19th, 30th. *South Atlantic States*, 7th to 10th. *East Gulf States*, 4th to 6th, 13th, 21st, 27th, 28th. *Ohio Valley*, 1st, 2d, 8th, 10th, 11th, 14th to 18th, 20th, 21st, 23d, 30th. *Tennessee*, 16th, 18th. *Lower Lake region*, 6th, 7th, 9th to 12th, 14th, 16th, 17th, 20th, 24th, 26th to 28th. *Upper Lake region*, 5th, 10th, 20th, 22d, 28th. *Upper Mississippi Valley*, 1st, 3d, 6th, 8th, 11th, 14th to 17th, 21st, 27th. *Middle Pacific Coast region*, 7th, 8th, 13th, 22d, 23d, 26th, 27th, 30th.

Solar halos were also reported from the following stations, not included in the districts named above: Saint Vincent, Minn., 13th; Olivet, Dak., 27th; Huron, Dak., 1st, 2d; Fort Keogh, Mont., 7th; Yates Center, Kans., 1st, 2d, 3d, 6th, 18th, 19th, 24th; Palestine, Tex., 13th, 26th; Indianola, Tex., 1st; Santa Fé, N. Mex., 4th; Yuma, Ariz., 7th; Salt Lake City, Utah, 1st, 4th, 7th; Mission, Idaho, 7th; Umatilla, Oreg., 21st; Albany, Oreg., 16th, 28th; Roseburg, Oreg., 26th; San Diego, Cal., 14th.

Lunar halos.—Lunar halos have been observed in the various districts on the following dates: *New England*, 25th. *Middle Atlantic States*, 1st, 3d, 14th, 21st, 23d, 25th, 28th, 29th. *South Atlantic States*, 23d, 25th, 28th, 29th. *Florida Peninsula*, 1st, 2d, 27th. *East Gulf States*, 1st, 3d, 21st, 22d, 25th, 27th, 28th, 29th. *West Gulf States*, 2d, 20th, 22d to 30th. *Ohio Valley and Tennessee*, 3d, 24th, 26th to 30th. *Lower Lake region*, 7th, 12th, 23d, 25th, 26th, 27th, 29th.

Lunar halos were also reported from the following stations not included in the districts named above: Moorhead, Minn., 30th; Olivet, Dak., 26th; Alexandria, Dak., 1st; Dodge City, Kans., 23d, 24th; Yates Center, Kans., 25th; Umatilla, Oreg, 29th; Olympia, Wash., 28th.

Mirage.—Nantasket Beach, Mass., 24th; Barnegat, N. J., 24th, 25th; Indianola, 1st, 2d, 3d, 5th; Alexandria, Dak., 5th.

MISCELLANEOUS PHENOMENA.

Sunsets.—The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 186 stations show 5,534 observations to have been made, of which 25 were reported doubtful; of the remainder, 5,509, there were 4,420 or 82.2 per cent., followed by the expected weather.

Sun spots.—The following record of observations has been forwarded by Mr. D. P. Todd, director of the Lawrence Observatory, Amherst, Mass.:

Date—June, 1882.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.	
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.
1, 3 p. m.	0	0	0	0	0	0	2	2
2. 4 p. m.	2	5	0	0	1	3	4	7
3, 5 p. m.	0	2	0	0	0	0	3	8
5, 2 p. m.	0	2	0	0	0	0	2	6
6, 2 p. m.	1	1	1	1	0	0	2	6
3 p. m.	0	0	0	0	0	0	2	6
7, 7 p. m.	0	0	0	1	0	0	2	5
8, 2 p. m.	2	6	0	0	1	4	4	11
9, 4 p. m.	0	8	0	0	0	8	4	19
10, 3 p. m.	0	‡10	2	3	0	8	2	‡25
13, 2 p. m.	1	7	....	....	1	2	2	‡35
15, 7 p. m.	0	5	0	0	0	0	2	‡40
16, 1 p. m.	0	10	0	0	0	0	2	‡50
18, 6 p. m.	1	5	0	0	1	5	2	‡55
19, 2 p. m.	0	0	0	0	0	0	.3	‡55
21, 4 p. m.	0	0	1	‡10	0	0	2	‡45
22, 12 m.	1	5	0	10	1	5	3	‡40
23, 3 p. m.	0	0	0	5	0	0	3	‡35
24, 3 p. m.	1	5	1	‡15	1	5	3	‡25
26, 2 p. m.	2	10	0	0	1	5	5	‡35
27, 3 p. m.	1	5	0	5	0	0	6	‡35
29, 3 p. m.	1	5	1	5	1	5	6	‡35
30, 4 p. m.	1	5	0	0	1	5	7	‡40

‡Approximated. Faculæ were seen at the time of every observation.

Mr. H. D. Gowey, at North Lewisburgh, Ohio, reports sun spots were observed on all clear days during the month. They were least numerous on the 8th, largest on the 14th, and most numerous on the 30th. Mr. David Trowbridge, at Waterburgh, N. Y., reports: 2d, 2 groups, 2 spots; 1 faint group has disappeared; 6th, 1 group, 1 spot; 7th, 1 group, 1 spot; 8th, 1 group, 1 spot, hazy atmosphere; 9th, 1 group, 2 spots; the group observed on 8th has disappeared and a new group appeared by rotation; faculæ in west and east. 11th, 2 groups, 7 spots; the new group observed on the 9th is extensive; a new group has arisen near the middle of the disk; faculæ numerous. 12th, 1 group, 4 spots; the new group observed on the 11th has disappeared. 13th, 2 groups, 6 spots; the group of the 12th appears to have separated into two. 14th, 2 groups, 13 spots; the large group has 12 spots; a new group has appeared by rotation; faculæ in the east. 18th, 2 groups, 7 spots; faculæ in the west. 20th, 2 groups, 10 spots; the large group has disappeared by rotation and a new one has appeared. 21st, 2 groups, 6 spots; same as observed on 20th. 22d, 2 groups, 4 spots; the spots are fading out. 23d, 3 groups, 5 spots; 1 new group has appeared by rotation. 24th, 2 groups, 3 spots; one of the groups observed on the 22d has disappeared; faculæ in the east. 26th, 1 group, 1 spot; one of the groups observed on the 24th appears to have faded out. 27th, 4 groups, 8 spots; one group has appeared by rotation; faculæ in the east; 28th, 4 groups, 12 spots; faculæ. 29th, 5 groups, 8 spots; 1 new group of 9 spots has appeared by rotation.

Meteors.—Grand Haven, 20th: At 9.35 p. m., a brilliant meteor, apparently about 3 feet in diameter, resembling a huge ball of fire, was observed in the northern sky, at an altitude of about 45°. It pursued a northeasterly course and disappeared at a point about 20° east of north. During its passage, which was of about fifteen seconds duration, a hissing noise was distinctly heard; a light was produced sufficiently brilliant to enable persons to read fine print. Yates Center, Kans., 17th: Between 11 p. m. and midnight a large meteor was observed, passing from a southwesterly to a northwesterly point, in a horizontal path about 30° above the horizon. It produced a light sufficiently bright to cast well-defined shadows, and left behind it a long fan-shaped trail of pale red color, which remained visible for several seconds. Before disappearing it burst into numerous fragments.

Polar bands.—Springfield, Mass., 14th; Punta Rassa, 5th; Nashville, 4th; New Corydon, Ind., 1st, 2d, 12th, 14th to 20th, 23d, 26th; Guttenburgh, Iowa, 9th, 13th; Gardiner, Me., 9th, 24th; Freehold, N. J., 6th 11th, 29th; Vineland, N. J., 8th, 13th; Woodstock, Vt., 13th; Wytheville, Va., 2d, 7th, 18th.

Earthquakes.—San Francisco, 27th: At 5.32 a. m. two severe shocks of earthquake, each of about ten seconds duration, were experienced. The interval between the shocks was about four seconds. No serious damage resulted, but crockery, glassware, &c., were broken. Reports from points along the coast between Petaluma and Hollister and as far east as Stockton state that this shock was the severest that has occurred since the re- rkable earthquake of 1868. It was most severe along the immediate coast, and de- ased in severity eastward, it being reported as a slight shock at Stockton. At San é, the walls of a number of buildings were reported to have been badly cracked. At nta Cruz Mountains chimneys were overturned and windows were broken. In this city the shock was unexpected, as such phenomena generally occur on warm, sultry days, while on this occasion the weather was cool and damp.

Zodiacal light.—Nashville, 4th, 6th, 10th, 12th, 14th, 16th; Monticello, Iowa, 5th, 6th. 12th; Cambridge, Mass., zodiacal light suspected, 5th, 9th, 12th.

Prairie and forest fires.—Fort McKavett, Tex., 29th.

Drought.—Shreveport, 30th: No rain has fallen since the 10th; crops very much in need of rain. Westborough, Mass., 30th: Month very dry; season backward. Clarksville, Tex., 30th: The corn and cotton crops are suffering for rain. College Station, Tex., 30th: Rain much needed in this locality.

Water-spouts.—Port Hope, Mich., 18th: Shortly before 2 p. m., a tornado-like cloud was observed passing over this section, about half a mile south of this village. After passing out over the lake, other clouds of ominous blackness were seen moving with great rapidity toward one point, and the water in the lake was thrown up in places and dashed into the finest spray. As the clouds met, a large black cone formed, projecting downward toward the water, which was boiling and seething with great fury. A few minutes later the water and clouds met, forming a perfect water-spout. The water ascended the spout with great rapidity, causing foam and spray to fill the air on every side. The phenomenon lasted about ten minutes. Steamship Colorado, off the coast of North Carolina, on the 5th, observed a large water-spout.

Insects.—Toledo, Ohio, 7th: Farmers report the appearance of a specie of worm on wheat, causing considerable damage to the tender stalks. Winnemucca, 29th: Black beetles and grasshoppers have caused great damage in this vicinity. Sandy Springs, Md., From 16th to 24th, the army worm appeared in great numbers; no serious damage has been done. Springfield, Mo., 5th: The army-worm has been observed in this section during the past week in considerable numbers, but no serious damage has been done. Leavenworth, Kans., 13th: Reports from Republican County state that the chinch-bug has done considerable damage to grain.

Sand-storms.—Coleman City, Tex., 19th, 20th; Santa Fé, 12th, 15th, 27th; Tucson, 9th; Yuma, 8th, 9th; Fort Verde, Ariz., 15th; Camp Thomas, Ariz., 1st to 6th, 10th, 11th, 12th, 15th, 28th; Umatilla, Oreg., 4th, 6th, 11th, 16th, 17th, 18th, 20th, 21st, 25th; West Las Animas, Colo., 29th, violent dust-storm from northwest.

ERRATA.

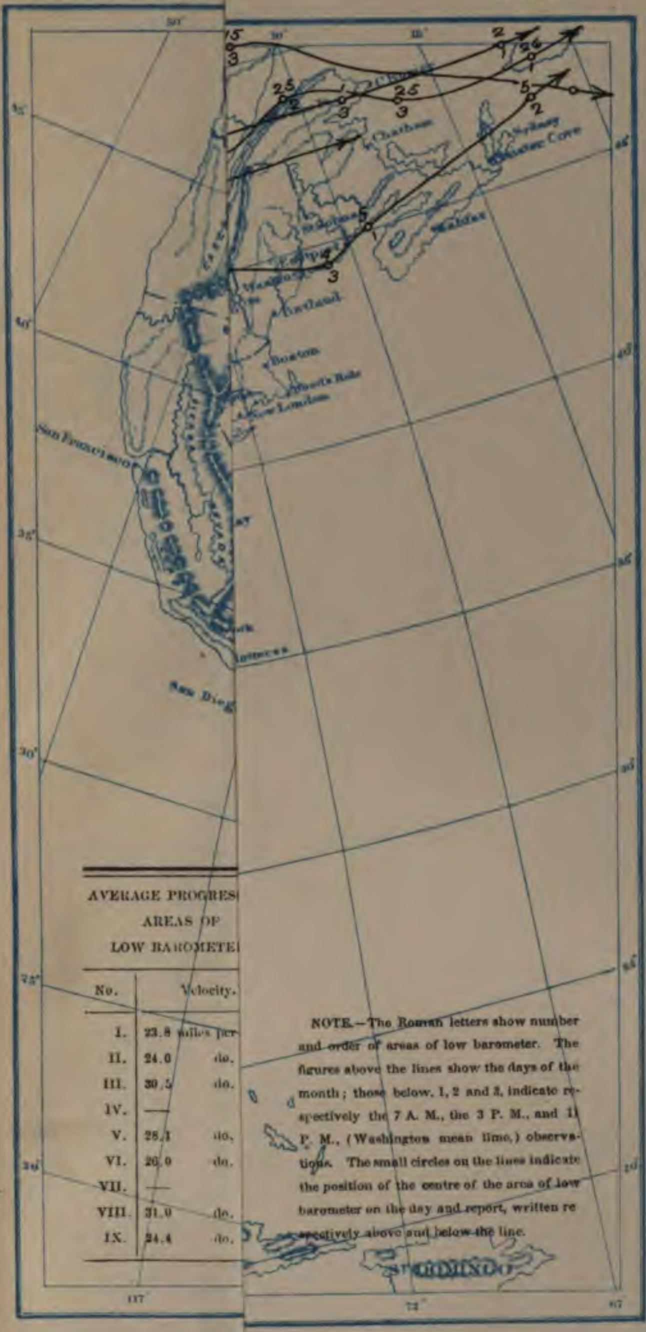
In the May Review, on page 2, under Barometric Ranges, the paragraph giving ranges at Eagle Rock and Umatilla should read Northern Plateau and not Southern Plateau.

On page 9, under the heading Deviations from Mean Temperature, in paragraphs giving mean temperature for Indiana, should read Illinois, and for Illinois, should read Indiana.

Published by order of the Secretary of War:

W. B. HAZEN,
Brig. and Brev. Maj. Gen'l, Chief Signal Officer, U. S. A.

No. I.

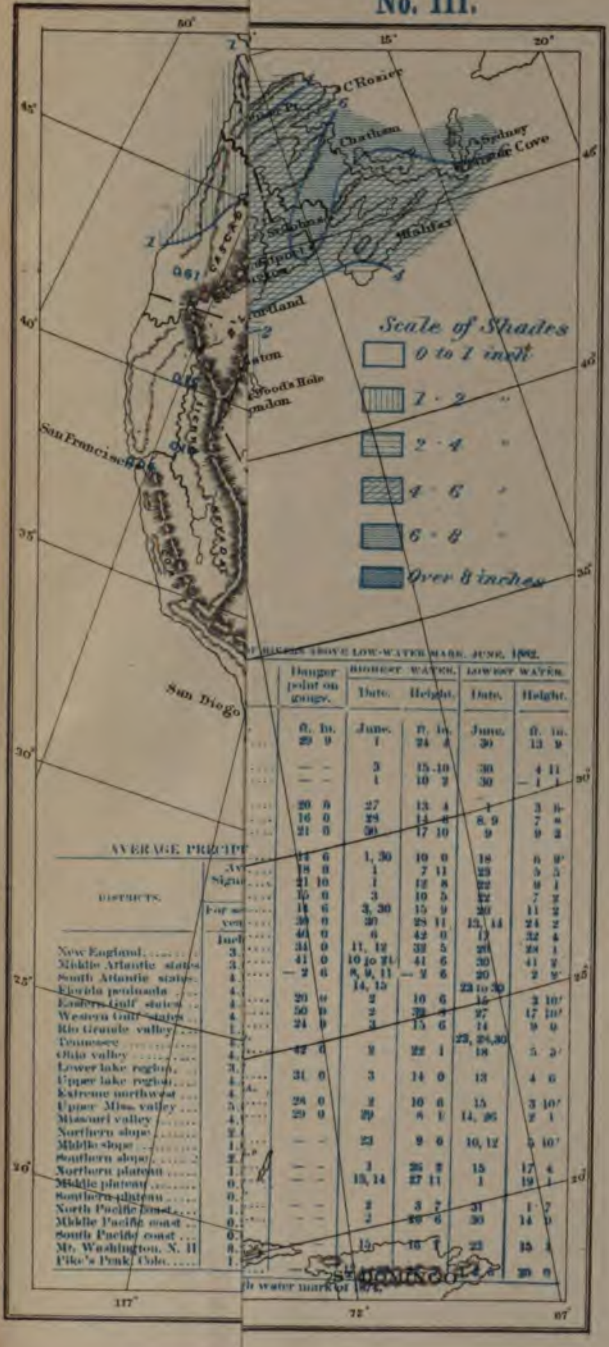


AVERAGE PROGRES
AREAS OF
LOW BAROMETE

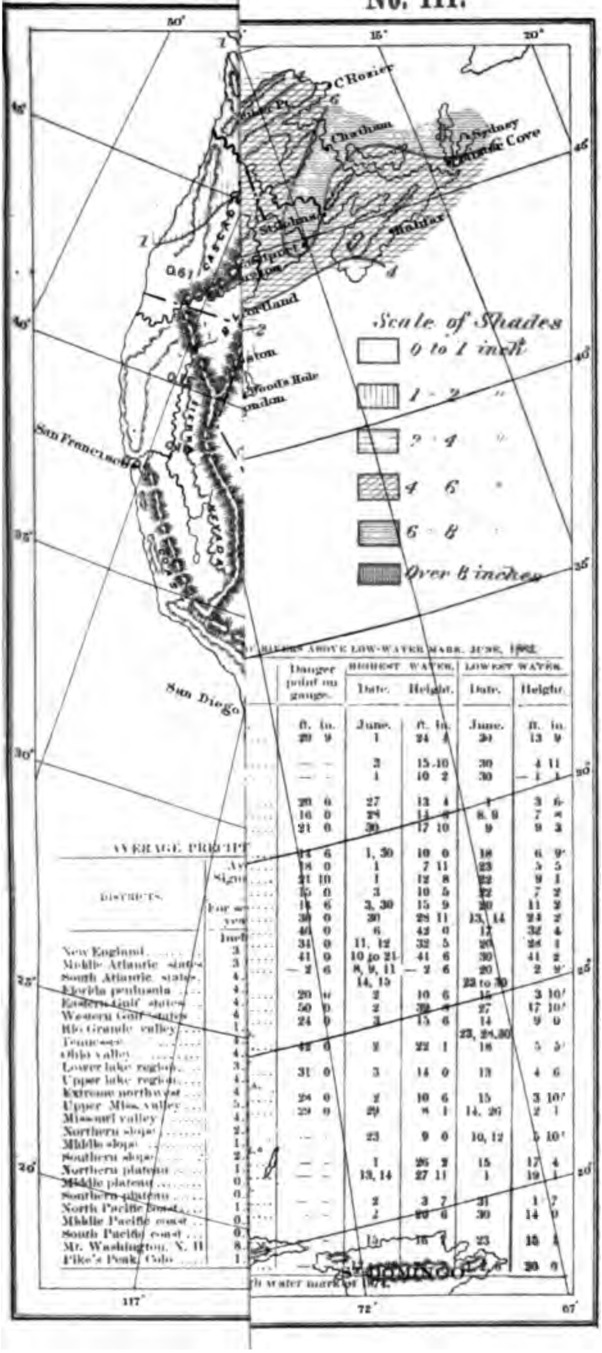
No.	Velocity.
I.	23.8 miles per
II.	24.0 do.
III.	30.5 do.
IV.	—
V.	28.1 do.
VI.	26.0 do.
VII.	—
VIII.	31.0 do.
IX.	24.4 do.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 3 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

No. III.


C Rozier
Chatham
Sydney
Cove
Halifax
Portland
Woods Hole
San Francisco
San Diego
ST DOMINGO
Scale of Shades
0 to 1 inch
1 - 2 "
2 - 4 "
4 - 6 "
6 - 8 "
Over 8 inches
AVERAGE PRECIP
DISTRICTS.
New England
Middle Atlantic states
South Atlantic states
Florida peninsula
Eastern Gulf states
Western Gulf states
Rio Grande valley
Tennessee
Ohio valley
Lower lake region
Upper lake region
Extreme northwest
Upper Miss. valley
Missouri valley
Northern slope
Middle slope
Southern slope
Northern plateau
Middle plateau
Southern plateau
North Pacific coast
Middle Pacific coast
South Pacific coast
Mt. Washington, N. H
Pike's Peak, Colo.
OF RIVERS ABOVE LOW-WATER MARK, JUNE, 1882.
Danger point on gauge.
HIGHEST WATER.
LOWEST WATER.
Date.
Height.
ft. in.
June.
h water mark of 1874.
45°
40°
35°
30°
25°
20°
117°
72°
67°
15°
20°
50°

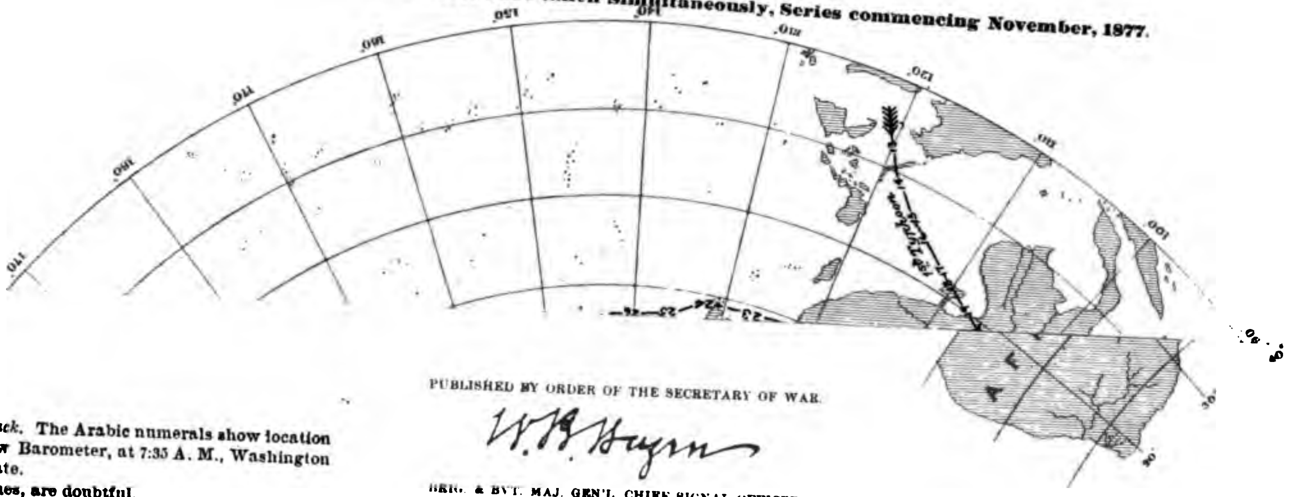
No. III.


C Rozier
Chatham
Sydney
Cove
St. Johns
Halifax
Portland
Wood's Hole
San Francisco
San Diego
CASCADE
SIERRA
NEVADA
Scale of Shades
0 to 1 inch
1 - 2 "
2 - 4 "
4 - 6 "
6 - 8 "
Over 8 inches
RIVERS ABOVE LOW-WATER MARK, JUNE, 1882.
Danger point on gauge.
HIGHEST WATER.
LOWEST WATER.
Date.
Height.
AVERAGE PRECIPIT
DISTRICTS.
New England
Middle Atlantic states
South Atlantic states
Florida peninsula
Eastern Gulf states
Western Gulf states
Rio Grande valley
Tennessee
Ohio valley
Lower lake region
Upper lake region
Extreme northwest
Upper Miss. valley
Missouri valley
Northern slope
Middle slope
Southern slope
Northern plateau
Middle plateau
Southern plateau
North Pacific coast
Middle Pacific coast
South Pacific coast
Mt. Washington, N. H.
Pike's Peak, Colo.
ST. DOMINGO
117°
72°
67°
45°
40°
35°
30°
25°
20°

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.



PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A

Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Broken or dotted lines, are doubtful.

INTERNATIONAL CHART.
Showing Tracks of Centres of Low Barometer for
July, 1880

CHART SHOWING THE C.L OFFICER.